ENGINEERING NEWS-RECORD

JULY 30, 1942

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INDUSTRIAL CAMOUFLAGE AND WHAT TO DO ABOUT IT

A News-Record report based on the latest authoritative information from War Department research and directives

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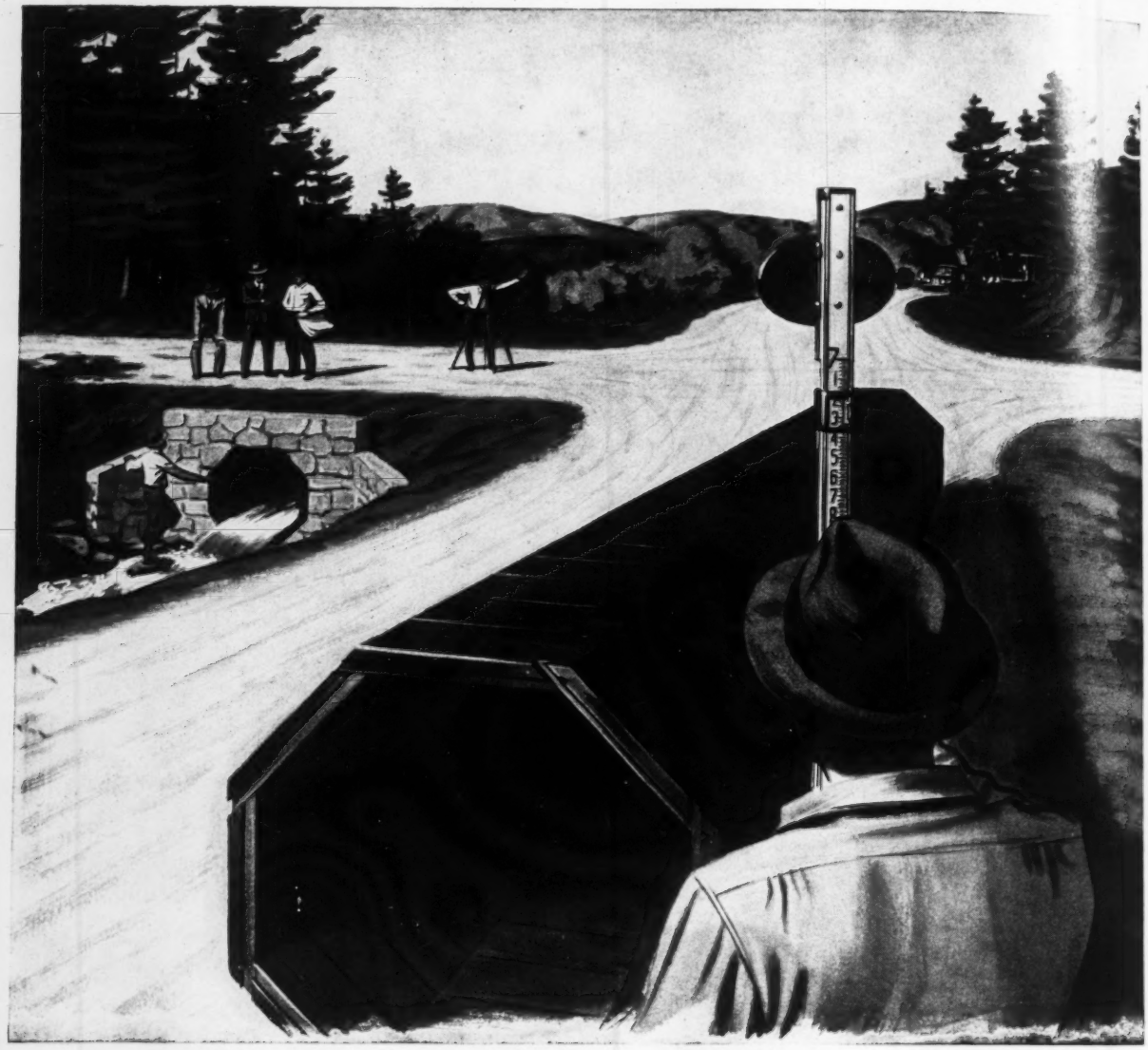

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Vol. 129 JULY 30, 1942 No. 5

COMING NEXT

• Up the hills and down the valleys near Shasta Dam, a 10-mile belt conveyor system has been moving sand and gravel for the last two years. Experiences in operating this mammoth materials conveyor, which delivers an average of 1,000 tons an hour, will be told by A. H. Whitmore, assistant engineer, U. S. Bureau of Reclamation.

• To aid in safeguarding its property from sabotage and during air raids, the Commonwealth Edison Co. of Chicago has created a special emergency service organization. Included in this is a fleet of patrol cars equipped with F-M radio, fire trucks, ambulances, field hospitals and portable kitchens.

• Floods occurring throughout the country in the last few months direct attention to the flood-control work at Houston, Tex. Here a $32,000,000 program is underway to provide complete protection for a half-million people and many industrial plants.

• Speed in construction is generated in war time. Dipping back into the past we find that in World War I speed records challenging present-day operations were hung up in building the "temporary" structure that is now the Navy and Munitions Building in Washington. What was done then is the subject of an article next week.

LOOKING AHEAD

• When the well runs dry at an ordnance plant it means more than thirsty throats. This situation calls for drastic action—such as that taken with a well at a plant in the Midwest, which was dosed with hydrochloric acid. As a result, the water flow was quadrupled. Details of the acidizing process and the use of an electrograph for investigation will be described.

• Storm sewer designs based on guesses rather than detailed engineering studies don't work very well. How to make accurate designs has been a subject of special interest to City Engineer John Wilson of Duluth, Minn. He discusses some frequently neglected factors of rain temperature, exposure of slopes to sun, water content of snow as well as snow melting, and suggests the use of additional data from the Weather Bureau.

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Your nearby Ryerson plant carries reinforcing bars, wire mesh, structurals, roofing... and practically every form of construction steel and allied products . . . in stock for immediate shipment.

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Complete Facilities for cutting, bending or forming Reinforcing steels to specification.

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Construction Financing Nears $9.5 Billions

ALMOST $9,500,000,000 in new funds have been made available for construction projects in continental United States since the opening of 1942. This record-breaking 30-week financing volume exceeded all previous yearly totals, and topped the volume for the corresponding period in 1941 by 93 percent.

Over 95 percent of the new construction capital, $9,050,000,000, was for federal work—both for regular departmental construction, and for military and naval projects vital to the war effort. Of the federal financing approximately $755,000,000, or 8 percent was for departmental construction, but even these funds are being used primarily for essential war projects. For example, the $206,810,000 appropriated for State, Justice and Commerce Departments included $199,740,000 for civil airports built to Army specifications; $3,675,000 for construction of navigation facilities in strategic waters; $2,875,000 for weather and radio observation stations; and $520,000 for airport paving.

Corporate financing, $281,000,000, was responsible for 3 percent of the 30-week new capital total, and the balance, $162,000,000, was for state and municipal projects. Both of these types of financing declined sharply from the volume for the period last year, corporate was 32 percent lower, and state and municipal down 51 percent.

NEW CONSTRUCTION CAPITAL

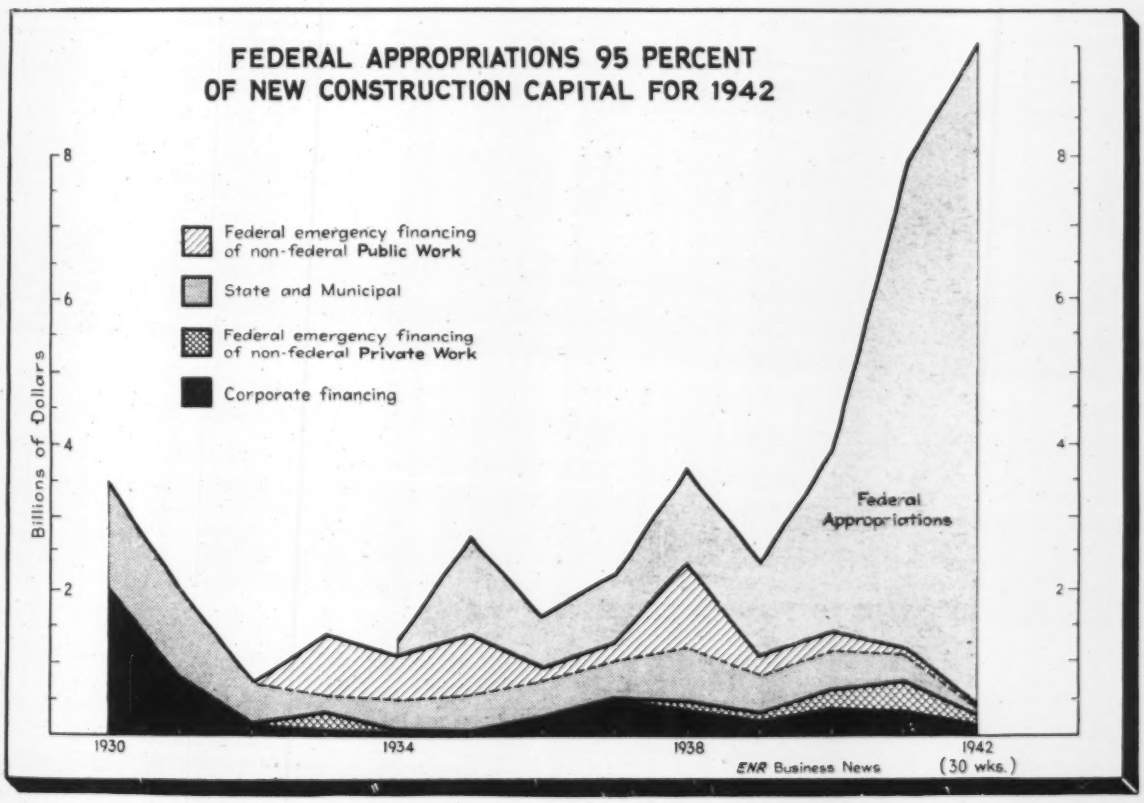
(Millions of Dollars)

	Corporate	State and Municipal	Federal	Total
1925	$1,966	$1,352	.....	$3,318
1926	1,824	1,344	.....	3,168
1927	1,784	1,475	.....	3,259
1928	1,568	1,379	.....	2,947
1929	1,758	1,418	.....	3,176
1930	2,032	1,434	.....	3,466
1931	787	1,235	.....	2,022
1932	159	561	.....	720
1933	292	1,091‡	.....	1,383
1934	77†	1,011‡	$ 194	1,282
1935	47†	1,337‡	1,354	2,738
1936	251	698‡	691	1,640
1937	518†	738‡	946	2,202
1938	457†	1,902‡	1,345	3,704
1939	304†	783‡	1,318	2,405
1940	624†	805‡	2,466	3,895
1941	741†	477‡	6,677	7,895
1942 (30 wk.)	281†	162‡	9,050	9,493

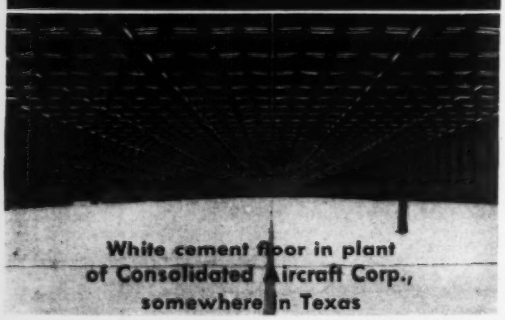
Note:—Federal appropriations include federal-aid highway, WPA, and regular departmental funds.

†Includes $237,000,000 RFC and PWA loans '33; $55,000,000, '34; $9,000,000, '35; $807,000, '37; $76,106,000 REA, $4,500,000 RFC loans, '38; $89,000,000 REA and $400,000 RFC loans, '39; $40,000,000 REA and $193,000,000 in RFC loans '40; $100,500,000 in REA and $282,000,000 in RFC loans in '41; $123,800,000 in RFC loans in '42.

‡Includes $814,000,000 RFC and PWA loans and grants, '33; $580,000,000, '34; $808,000,000, '35; $164,700,000, '36; $207,000,000, '37; $723,265,000 PWA, $99,844,000 RFC, $320,986,000 USHA loans, '38; $216,000,000 in USHA loans, '39; $219,000,000 USHA, $5,000,000 RFC loans in '40; $30,000,000 in USHA, $6,900,000 in RFC loans in '41; $3,619,000 in RFC loans in '42.



I never expected to see the day when we'd get LIGHT FROM OUR FLOORS



White cement floor in plant of Consolidated Aircraft Corp., somewhere in Texas

Designed by The Austin Company, engineers and builders

PLANTS SPEED UP WAR PRODUCTION

with floors that reflect light!

White Cement Floors are a new source of light—increasing illumination as much as 20% or more in one of the nation's largest aircraft plants. Let us send you specific data on their efficiency, economy and advantages.

FLOORS, like walls and ceilings, can aid the better lighting of a factory.

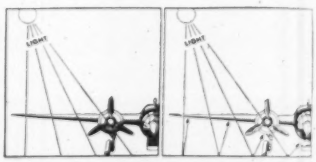
Few people ever thought of this—until a number of large aircraft plants installed white cement floors. Today these light-reflecting floors are speeding the flow of vital war machines. Today the same concerns are installing white cement floors in other new plants. What they are doing there can be applied to many other plants.

White floors made of Atlas White cement absorb less light and thus distribute and diffuse much more light than dark floors. In one factory they showed a 60% higher reflection factor than gray cement floors in same plant, and increased vertical illumination 20%.

White cement floors throw more light on the bottom sides of bomber wings and fuselages during assembly. By reflecting more light they also increase general illumination. They reduce shadows in work areas along *any* production line. They increase efficiency of employees, even the greenest . . . guard their health, comfort and safety. They give all the advantages that factory men, from executives to the last worker, associate with better light and better sight.

Shortages and priorities do not affect this new source of light. Non-critical materials are available for white cement floors today. To obtain the same light intensity over a darker floor would require more rubber and metals that are needed for the war effort. But white cement floors, by increasing illumination, save lighting As light generates heat, air conditioning also may be reduced. And electrical equipment requires large quantities of aluminum, copper, rubber, steel, magnesium, lead, zinc, resins—all priority materials.

These savings in first cost of electrical equipment may more than pay for the extra cost of a white cement floor. In addition, there are large savings in operating costs for light and air-conditioning. And maintenance of a white cement floor is simple—regular sweeping, occasional damp mopping, periodic scrubbing.



(left) Gray concrete floors and other dark floors absorb more light and reflect less into work areas where it's needed.

(right) White cement floors have a high reflection factor. This reflected light reaches up into former shadow areas, increases general illumination, makes seeing easier, reduces errors, increases production.

Light-reflecting floors, made with Atlas White cement, are valuable today, and will be tomorrow, for new floors or to retop old ones in *any* building wherever production, lighting, sanitation and safety are important. Write for details. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., N.Y.C.

ENR-F-2

LIGHT-REFLECTING FLOORS

MADE WITH ATLAS WHITE CEMENT

The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • JULY 30, 1942 • VOLUME 129 • NUMBER 5

Army studies re-negotiation of construction contracts

H. W. Loving to head adjustment section for such contracts, but problem of defining excessive profits that are to be cut under new procedure remains without solution

Within a few weeks the War Department expects that it will be ready to announce the procedure and policies it will follow in the re-negotiation of construction contracts to eliminate excessive profits.

Legislation enacted last May directed the war agencies to "re-negotiate" any contract to establish a lower price whenever cost experience in carrying out the contract showed that the original price would yield an excessive profit to the contractor.

To carry out this law, departmental Price Adjustment Boards have been set up by the Army and Navy. To deal particularly with construction contracts, the Corps of Engineers has appointed Harry W. Loving to head a special price adjustment section. Loving has been working for the department on construction price and contract-letting matters ever since he was appointed to head the first board charged with award of negotiated contracts by the Quartermaster Corps in the early days of the cantonment program.

Subordinate price adjustment units are being set up in the division and district offices.

Many question marks

Beyond this organizational framework, however, the whole matter of re-negotiation is still full of question marks. It is not yet clear, for instance, whether only those contracts that appear to involve excessive profit will be re-negotiated or whether an examination of costs and profits should be made as a routine step at the termination of all contracts. Present thinking favors the latter alternative.

Contracts of the cost-plus-a-fixed-fee type in general would not be affected by re-negotiation except in the improbable event that actual cost should prove less than estimated cost and thus render excessive the fixed fee, which is always set as a percentage of the estimated cost.

There is debate also as to whether re-negotiation should be handled in terms of the total profits of a particular contractor—a view generally favored by the War Department—or in terms of the profits on a particular contract. Many contractors fear that if the former approach is adopted it will become difficult or impossible to clear final payments when contracts are finished. They fear also complications on the many jobs that are carried out as joint ventures by several contractors.

Another difficulty is that the legislation sets no standard as to what profits are to be considered excessive—how large a percentage and whether a percentage of gross business done or of capital invested.

As regards war contracts generally, high departmental officials have informed *Engineering News-Record* that profits should not exceed a moderate percentage of either gross business or capital. Literal application of this policy to construction would result in considerable hardship, since few contractors have any very large capital investment relative to the size of the jobs they do.

Another factor that is considered relevant is the profit experience of other firms doing similar work. Many contractors fear that application of this yardstick might result in reducing the permitted profit level on lump-sum contracts to the fee rates used on the risk-free cost-plus jobs.

FWA photo by Zerwick

First Vital Area Board discusses construction needs

The first Vital Area Board, one of a number to be organized by the Federal Works Agency as part of its decentralization program, is shown above at its first meeting. Actions of this group are expected to set precedents for similar organizations elsewhere.

The board will examine all FWA war public works projects—in New York and New Jersey, and send recommendations as to need and priorities to the War Production Board in Washington. It will act to end bottlenecks in critical materials and speed construction of needed public and community facilities.

Above, left to right, are: Henry M. Evans, of the Bureau of Government Requirements, WPB, who is sitting in with the Board as an observer; Louis L. Bennett, representing the Federal Security Agency; Major Louis Segall, Corps of Engineers, representing the commanding general, Second Corps Area, U. S. Army; John M. Gallagher, regional director of the FWA in New York; Lieut. Comdr. F. H. Dechant, CEC, USNR, representing the superintending engineer, Bureau of Yards and Docks; the U. S. Navy; and William W. Jeanes, representing the Federal Public Housing Authority.

WASHINGTON HIGHLIGHTS

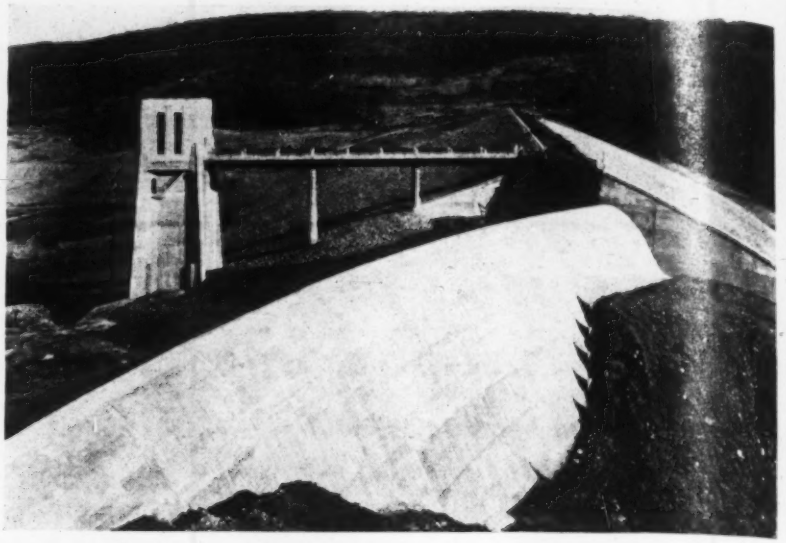
CONSERVATION Order L-41 has been liberalized in several respects by Amendment No. 2. The latter permits an owner to begin reconstruction of certain types of non-residential construction damaged or destroyed provided immediate restoration is "necessary for the prosecution of war or to protect public health or safety." Construction authorized is defined as all construction other than residential and agricultural. The amendment also exempts the construction of irrigation ditches in which only earth and other unprocessed material, and drain tile not more than 12 in. in diameter and without bell joints are used.

BUILDERS with project ratings under Order P-19, serial numbers above 81, have been restricted in their use of the ratings in Amendment 1 to the order. The order as originally issued did not limit types of material builders could obtain for war construction projects. Last week's amendment limits builders to materials that are to be physically incorporated in the projects and to certain "expendable material" consumed in construction—defined as "materials which will be wholly consumed at the location and during the construction of the project."

USE of copper and copper base alloy is forbidden in building construction by Conservation Order M-9-c-4, although the order does not affect wiring. The order forbids delivery, acceptance of delivery, or use, of any copper or copper base alloy pipe, tubing or building material containing 5 percent or more copper, except by specific authorization. Exceptions are uses of 25 pounds or less to repair a building where the metal so used is to replace copper building material previously installed, and use by the armed services.

THE War Production Board last week cleared the way for the manufacture of not more than 500 "off-the-highway" trucks for use by mining and construction industries and for export. Production of the automotive giants was stopped May 31 by the WPB. Since most of these trucks are custom-built, there is no stock pile available for replacements or new machines. The order, Amendment No. 1 to Supplementory General Limitations Order L-1-E, specifies that the quantities and types any firm may build must be authorized by WPB.

CONSTRUCTION equipment owned by the now-abolished Civilian Conservation Corps is being shipped north for use on the Alaskan Highway.



Massachusetts flood control dam completed

Knightsville Dam on the Westfield River near Huntington, Mass., has been completed by the Providence, R. I., District, U. S. Engineers. Designed to store floodwaters, the 1,200-ft. hydraulic fill earth-dam has a capacity at spillway crest level of 49,000 acre-feet. About 9,700 acre-feet of this storage is for future power installation, the remainder for flood control. When full, the reservoir will have an area of 960 acres.

The non-overflow earth section rises to an elevation of 160 ft. above river bed. The concrete ogee spillway section is 400 ft. long, with elevation 20 ft. lower. About 1,150,000 cu.yd. of earth and 125,000 cy.yd. of rock were required for the earth embankment and 49,000 cu.yd. of concrete for the spillway.

Appurtenant structures include outlet works consisting of a 16-ft. dia., 600-ft. long concrete-lined tunnel in rock; an approach channel in rock. Discharge is controlled by three mechanically operated 6x12-ft. gates at the entrance to the tunnel.

Total cost of the project was $3,170,000 of which $2,300,000 represented design and construction, $250,000 the cost of lands and damages, and $620,000 the cost of relocation of state highway.

George M. Brewster & Sons, Inc., of Bogota N. J. held the general contract. Col. H. S. Bishop Jr. is district engineer at Providence and T. S. Burns is chief of the engineering division. Resident engineers for the army were E. L. Beriswell, W. A. Grady and W. F. Maschmeyer. Karl Yost was resident engineer for the contractor.

Prospects uncertain for Florida Canal

Either early action or none at all is expected on start of construction of the barge canal across Florida, authorized in legislation signed by the President last week. The bill authorized, but provided no funds for, expenditure of $80,000,000 on the construction of a 12-ft. channel across the peninsula and deepening of the Gulf Intracoastal Waterway to a uniform 12 ft. from the mouth of the new canal to the Texas border. (*ENR*, July 16, p. 76.)

It is not yet known what steps, if any, will be taken to find money for the project, since it's considered doubtful that an appropriation bill could pass.

Oil pipeline provisions of the bill are not of much importance. The trans-Florida pipeline authorized is already being built by the Defense Plant Corp., and the line from Yazoo, Miss. to the Atlantic Coast is opposed by the Army as well as the Petroleum Coordinator and almost certainly will not be built.

Authorize billion for naval construction

Just under a billion dollars worth of naval shore facility construction is authorized by the legislation that passed the House last week. Nearly half the money, $399,494,000, is for aviation facilities. In addition to expansion of existing airbases this includes construction of two new stations in the Northwest, one on the Gulf, two in the Central Eastern states, one in the Southwest, two in the Caribbean, one each in Hawaii and Alaska.

Added to this, it provides for new $10,000,000 air training stations at Ottumwa, Ia., and Hutchinson, Kansas, as well as a glider training station at an unselected location, and four new lighter-than-air stations inside and five outside the continental United States.

The bill also provides for construction of two new storage depots in the East.

A total of $60,000,000 is authorized for undisclosed fleet facilities and $315,000,000 for materials and equipment to build advance bases in combat areas.

Plan immediate building of road to Panama Canal

Immediate construction of a low-standard "pioneer road" to close the existing gaps in the Inter-American Highway is contemplated in agreements worked out by the U. S. State Department with the governments of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama. The plan is to open a through highway connection as soon as possible without waiting for completion of a permanent road—from the southern border of Mexico to the Panama Canal.

About a thousand miles of this road already have been completed, and the remaining gaps to be closed total some 625 miles. The pioneer structure is to be passable in all weathers, will provide a width of 10 to 16 ft. with an 8-in. gravel surface. Grades will be held to 10 percent, curvature to 66 ft.

Cost of the road will be met by the United States, but it is not yet established through what agencies it will be built. Neither is it established whether the money for construction will come out of the $20,000,000 approved by Congress last December for completion of a permanent highway. Expectation is that the work will be handled through the Central American governments, with the Public Roads Administration providing technical assistance. There is a possibility, however, that the Corps of Engineers may build the road with troops.

• • •

Southwest war building tops billion, Army says

Authorized war construction assigned to the Southwestern division of the U. S. Engineers is in excess of $1,300,000, Col. Stanley L. Scott, division engineer at Dallas, Texas, said recently. The figure does not include projects being built by the Navy, Defense Plant Corporation, Maritime Commission, and other public and private agencies.

Value of the work being placed in the Southwestern division averages about $5,000,000 per day, Colonel Scott said, adding that this total represents about 25 percent of all construction work carried on by the War Department within the continental limits of the United States.

"The rate is about five times that at which work was being placed by private and public agencies in the Southwest prior to the emergency," the engineer stated.

Colonel Scott coupled his announcement with a plea to the public and private and public agencies to end or curtail non-war building to prevent shortages of essential building materials for the war work.

War adds to sanitation health and water problem

The problem of maintaining adequate water supply, and of maintaining current supplies in reasonably suitable condition in the face of war-time restrictions on needed materials continued to be a major factor in the nation's water supply picture last week.

The State of Connecticut faced a pollution problem blamed on increasing manufacturing activities and stringent priority restrictions on essential materials. Although Sanford H. Wadhams, director of the Connecticut Water Commission, said that the pollution problem is as yet not serious, water supply men began serious investigation of means of curbing the pollution.

It was pointed out that industrial discharge into the stream, if allowed to progress without control or added purification facilities, could result in killing fish and ruining water recreation facilities. The principal difficulty appears to be the dearth of treatment equipment. Water Commission engineers, who have consulted with outside engineers in order to obtain substitute materials and develop means of keeping the situation under control, have directed installation of wooden tanks and runways to slow up industrial waste discharges. Additionally, chemical treatment has aided greatly in keeping water bodies relatively pure, and the increased demand for drinking water supplies within the state, as well as added disposal facilities, has to date been adequately handled.

Crawfish cause leakage in wooden reservoir

One of the peculiar troubles of water supply engineers cropped up at Brunswick, Md., recently, when local officials traced leakage of between 30 and 40 gpm. from a 3,000,000-gal. wooden reservoir to the activities of crawfish.

The fish had worked their way through tar seams on the bottom of the reservoir.

During a twenty-day repair period, the city was forced to curtail water service for all purposes except essential health and sanitation.

Dade County, Florida, faced an entirely different cause for pollution in the numerous canals in the county—the problem of flowers. According to M. T. Lowry, chairman of the county commission, hyacinths have so clogged some of the canals that water flow has practically reached a standstill. Trapped fish are dying, and other debris collects in the water. Additionally, mosquitoes have been breeding in the stagnating water.

Moving to correct the situation, the county commission faced the problem of obtaining fuel for a county-owned dragline to do the work.

The City of Alexandria, La., has received an initial grant of $83,000 to sink six test wells on property outside of the city, where permanent wells for a new water system will be located, if sufficient supplies become available.

Meanwhile, the City of Philadelphia, Pa., prepared to go ahead with its long-planned (*ENR*, June 18, 1942, and previous) $18,000,000 water system improvement program, after having received favorable priority ratings from the War Production Board.

On the Pacific Coast, sanitary engineers viewed with alarm numerous sewage disposal "emergencies" that had cropped up. Apparently all stemmed from either hasty planning necessitated by wartime demand housing and industrial demands, or from reluctance to spend more than absolutely necessary where living quarters built were not considered to be permanent structures.

Two cases in point were the worries of Seattle, Wash., over the fact that no definite sewage disposal plan was said to have been evolved to care for some 2,400 defense-worker homes at suburban Kirkland and Renton, where local facilities are already reported at capacity; and the concern of Arcadia, Cal., residents over lack of adequate sewage disposal facilities for the alien camp now situated at nearby Santa Anita race track. Cesspools built as expedients have been declared a nuisance and health menace by civic authorities, who urged remedial measures.

• • •

WPB calls nation's power resources adequate

If used wisely, America's resources for producing electric power are sufficient to meet all requirements of war and essential civilian production, J. A. Krug, chief of the power branch of the War Production Board, said last week.

He said, however, that some local shortages due principally to difficulties of transporting fuel for steam plants probably would occur, and urged care in private use of electricity.

The improved power outlook was attributed to rains that have built up reservoirs behind hydro-electric dams to the huge generator production program, and to extensive interconnections and adjustments for the output and transmission of electrical energy.

The Southeast and the West were seen as the brightest spots in the power production picture. In the South, Mr. Krug said, there now are two billion more kilowatt-hours of power available in reservoirs than at any time last year.

Engineers' contribution to war effort in many fields features A.S.C.E. meet

War plant and camp construction, sanitation, civilian protection, post-war planning and substitute materials discussed at annual convention held at University of Minnesota

Major contributions of American engineers to the civilian part of the nation's drive to victory was the focal point of discussions at the 72nd annual convention of the American Society of Civil Engineers, held at Minneapolis, Minn., last week.

How great that contribution continues to be was evidenced in the comparatively small attendance at the session, many members being forced to forego the meeting because of press of war work.

Meetings were held at the Coffman Memorial Union and at the St. Anthony Falls Hydraulic Laboratory, University of Minnesota.

The board of direction met at the Center for Continuation Study at the university Sunday and Monday. Much of its time was given to considerations of question raised in connection with war construction contracts; to requests from war agencies for aid from the society in special studies either planned or under way, and to a report from Howard F. Peckworth of the society's headquarters staff, on the national employment picture. Discussed was the possible effect of the war production program on the civil engineering profession within the next year, and how best the society can aid its members in meeting readjustments that the shift from construction to production may bring.

The board voted to hold a fall meeting jointly with the Engineering Institute of Canada at Niagara Falls, Ontario, during the week beginning Oct. 11.

Local sections conference

Representatives of 25 local sections of the society met all day on Tuesday to exchange views on their special problems. Sections represented included those of the Midwest, Mountain States and the Pacific Coast.

Civilian protection in regions represented by the delegates to the conference was actively discussed at the morning session, led by E. P. Goodrich, chairman of the society's national committee on civilian protection in war time.

Much of the afternoon was given over to a report by Mr. Peckworth on labor conditions in the civil engineering field as he found them in his nationwide travels. Union activities were found in some places, he said, and on a few war jobs, difficulties in getting adequate compensation for some classes of engineering work have brought demands for organization of the engineers. These conditions, it is hoped, can be cleared up without resort to unionization.

War work of the society

What the Am. Soc. C.E. has done and is doing to advance the war effort was reviewed by E. B. Black, president of the society at a luncheon meeting arranged for the delegates to the local sections conference by the Northwestern Section. In addition to extensive work on government committees, Mr. Black noted that four members of the headquarters staff now are in military service, Donald P. Barnes, Allen P. Richmond, C. E. Beam and Walter Jessup.

Mr. Black quoted Major General Eugene Reybold as characterizing this as an "engineers' war," which he said is evident in the serious shortage of engineers both on war contracts and in the military services. He urged engineers to bring pressure on organizations with whom they have contact to release all engineers who can be spared for war work.

E. B. Black, Am. Soc. C.E. leader

Other speakers at the opening session were Samuel C. Lind, dean of the Institute of Technology of the university, Major Marvin L. Kline of Minneapolis, who is an engineer, and George C. Priester, president of the Engineers Club of Minneapolis.

Evacuation of civilians

Civilian protection came up again for consideration at the opening technical session on Wednesday, the subjects being evacuation of civil population from areas under air attack, industrial camouflage, and protection against saboteurs. Prof. Charles B. Breed of M.I.T. reviewed the several plans for evacuation of civil population that have been made in this country, such as that of the Pennsylvania highway department for people evacuated from New Jersey. Special emphasis was laid by Mr. Breed on the need for preparatory training and for recognition of the many factors involved, such as housing evacuees, food supply, and sanitary facilities.

Sanitary problems connected with evacuation of civilians were enumerated in more detail by Paul E. Langdon, consulting engineer, Chicago. Minnesota, he said, has prepared detailed plans for evacuation of its large cities. In Los Angeles, evacuation was considered but abandoned as impracticable. Massachusetts has a carefully worked out plan for emergency sanitation in evacuations, including a manual for the sterilization of water supplies.

Possible sources of attack by saboteurs were discussed in a session at which E. P. Goodrich, chairman of the society's committee on civil protection, questioned other members of the committee and a representative of the FBI. These men were Charles B. Breed, head of the transportation division; Paul E. Langdon, sanitation division; Philip Sporn, power; John I. Parcel, structural; and Robert H. Cunningham representing the F.B.I. For obvious reasons, publication of the questions and answers in this session was restricted.

Hydraulics division

The hydraulics division held its meeting in the university's hydraulic laboratory at St. Anthony's Falls on the Mississippi River in Minneapolis, part of the session being given over to a description of the laboratory by the director, Lorenz G. Straub, and to a demonstration of its unique facilities. Papers at this session were on wartime water supply problems by Major R. E. Lawrence, chief of the water and sewage unit, engineering branch of the Construction Division, office of the Chief of Engineers, U. S. Army, and on monthly summaries of stream-flow by Walter B. Langbein, U. S. Geological Survey.

Camp construction

Camp and war-plant construction operations were reviewed in the construction division meeting. Charles T. Leeds, consulting engineer, Los Angeles, described operations on one of the Pacific Coast camps, telling of devices used to speed work such as use of pressed steel rafter slats to save dapping each rafter and the use of plywood gussets in framing some of the buildings.

An interesting element of that job was the water supply which comes from wells sunk in a river valley bottom close to the sea. A salt-water barrier was built across the lower end of the valley to keep salt water from coming upstream in dry

weather where it might percolate into the sands from which the supply is drawn. (*ENR*, March 12, 1942, p. 406).

Other construction operations described were those at two ordnance plants. These papers were prepared by A. J. Duvall, consulting engineer, St. Paul, and A. C. Polk, consulting engineer, Birmingham, neither of whom was able to be present due to the pressure of their war work.

Use of substitutes

Use of timber as a substitute for structural steel and use of plain concrete for reinforced concrete were considered by the structural division at its meeting.

Recent developments in timber framing and in the design of timber structures, according to Lawrence P. Keith, manager of the Chicago office of the National Lumber Manufacturers Association, have been a major factor in expanding the availability of timber to meet the shortage of structural steel. Prefabrication on a production-line basis is an especially notable development. Outstanding design developments he said were glued laminated construction, composite-type timber bridge decks and ring-connector construction.

Duration of stress

Of special importance to engineers designing timber structures, Mr. Keith said, is application of the principle of duration of stress in their design computations. By diagrams showing the results of extensive stress studies, Mr. Keith demonstrated that stresses much higher than the dead load stresses can be safely used in the design of timber structures when the stress is of short duration, such as wind load stresses. In airplane design this quality is used to permit increases of over 200 percent above dead load stresses to meet stresses of very short duration.

Taking bridge designs as an example, Mr. Keith said that studies have shown that impact can be neglected in design of timber trestles to carry high-speed trains. In these trestles, designing to meet possible live loads due to stopping a train on the trestle calls for larger sections than would be required to meet impact when the duration-of-stress theory is applied in the design.

In discussion of Mr. Keith's paper, R. P. A. Johnson, wood consultant of the WPB, said that lumber must do a still better job in meeting the need for steel because competition for lumber itself exists between the various war agencies.

Construction lumber now is under control but there are grades and size that still are not covered. Lists of these sizes and grades now are available in the lumber division of the WPB.

Glued laminated construction using odd sizes will materially help in meeting the lumber shortage, Mr. Johnson said. He added that while it may not be able to get the higher grades of lumber or to have the use of higher stress authorized, much can be done to save material by a rational approach to load assumption in designs.

Charles S. Whitney, consulting engineer, Milwaukee, in discussion of the substitution of plain concrete for reinforced, said that an unreinforced arch can be used when the dead load is large as compared to the live load and when volume-change moments are not large. In such design it is important to have the arch axis follow the dead-load pressure line quite closely.

These conditions indicate that plain concrete could be used for buried igloos where there is practically no live load. Where there is little or no live load, designs can safely include a limited amount of tensile stress on the concrete.

Mr. Whitney's paper included a new method for the design of the rib section of an arch to supersede the old method requiring that the line of pressure be kept within the middle third of the rib.

Prof. Clyde T. Morris, Ohio State University, said that in addition to arches, plain concrete can be used for retaining walls, end walls for igloos and for foundation walls in which low tension stresses must be resisted. Increases in the yardage of concrete are justified to save steel, he said, and much can be done by proper proportioning to obtain higher strength values and hence smaller dimensions.

Camouflage costs

The Army's experience with industrial camouflage to date has shown that camouflage of industrial plants costs from $1,000 to $5,000 per occupied acre, according to Maj. Donald P. Barnes.

Maj. Barnes, a member of the engineer board at Fort Belvoir, Va., said that until two years ago there was little information available on camouflage excepting that gathered in World War I. Intensive study since then, supplemented by European experience, has brought out much of value, especially in treatment of industrial plants subjected to the type of air attack that may be expected in this country (see *ENR* this issue, p. 52).

Water and sewer works

Considering all the phases of sewage disposal, there are probably 45 types represented in army sewage plants, ranging from the old fashioned Doten plant to high degree treatment with activated sludge, Louis H. Kessler, chief of the water, sewer and services unit, repairs and utilities branch, Construction Division of the War Department, said.

From operating statistics and analyses of these statistics, the Construction Division is gradually reducing the type of new construction to two or three as being the most economical and efficient. Two-stage biofiltration treatment probably is unnecessary for any army plant, Mr. Kessler said.

A. E. Jensen, superintendent of water-

Study problem of war labor migration

An estimated 2,000,000 persons, including individual workers and their families, is considered a conservative figure on the number migrating from cities and towns to other places to take up war industry work, according to Robert K. Lamb, staff director of a House of Representatives committee investigating national defense migration.

The problem of the migrant, the community he left behind him and the community to which he moved is the subject of investigation, Mr. Lamb told members of the Am. Soc. C. E. at its Minneapolis meeting.

Contrary to general belief, he said, committee investigations show that most of the migrants are from villages and smaller towns, and not from agricultural areas. Only a few have moved long distances. Geographic concentration of war contracts is primarily responsible for these migrations.

The areas into which certain laboring migrants move were characterized as federal "islands," sometimes tax exempt, or where payment for services are not entirely satisfactory. What will happen to these areas and to the migrants themselves once the war is over is a matter for serious concern. Mr. Lamb emphasized that the problem is not—as it was in 1940 and 1941—a matter of migration of destitute persons, but a matter of movement by persons whose presence brings immediate civic problems to the communities which must house them.

Supplementing this report, Arthur S. Milinowski, of the St. Paul, Wis. Planning Board, and Homer Hoyt, director of research for the Chicago Plan Commission, pointed out that the problem is not one requiring immediate solution but would become serious progressively in the years following the end of the war.

Possible use of at least a portion of the newly built war plants for peacetime production was seen as one solution for the problem.

Seasoned wood scarce

Lack of proper seasoning of much of the lumber that is now available is a handicap to designers, but its effect can be minimized by recognizing in design that little shrinkage takes place endwise in lumber, according to Lawrence P. Keith, manager of the Chicago office of the National Lumber Manufacturers Association. Stresses should be based on the assumption that only the lower stressed grades of lumber will be available for most building work, the better grades being absorbed by airplane and other military operations. The 1,200 lb. stressed grade is about the upper limit, he said.

works for Minneapolis, and L. N. Thompson, superintendent of the St. Paul water department, presented papers covering their experiences in operation of water softening plants of those cities.

Minneapolis takes its water supply from the Mississippi River; St. Paul from a chain of lakes lying to the north of the city, supplemented by an auxiliary emergency pumping plant on the Mississippi River.

Chlorination of water supply in Minneapolis began a few months after this practice was inaugurated at Boonton Dam, in New Jersey, in 1908, and in 1913 filtration started. After 30 years of filtration experience, it seemed advisable to consider further improvements, and a water softening plant for reducing the mineral content and the organic content was put in service in 1941.

St. Paul installed its original mechanical filter in 1921, and its softening plant in 1939. The city estimates it has saved its citizens about $300,000 per year because of the practice of softening water.

Preparedness at Chicago

A. J. Schafmayer presented the defense plan for sewers in Chicago under the general subject "Utilities Preparedness in Chicago," reading a paper prepared jointly by Thomas Garry, Harry M. Forrey, Tenney S. Ford, and himself.

The paper by Lawrence M. Orton, member of the city plan commission of New York City, on the relationship of post-war public works program to the city plan was read by T. T. McCrosky, executive director of the Chicago Plan Commission.

In discussing the paper, George H. Herrold, planning engineer of St. Paul, pointed out the value of a post-war public works program by comparing it to the program initiated by St. Paul in 1928—a $16,000,000 program—that was carried out during the depression and kept laborers and artisans at work until 1935. Mr. Herrold also cited the expenditures made by private industry which were inspired by this planning program—building permits from 1928 to 1935, inclusive, totaling over 57 million dollars, of which 11 million was spent in 1930 and 14 million in 1931.

Mr. Herrold gave figures showing the city's bonded debt and the margin available for capital investment program for city planning projects after the war. He stated that in addition to certain state and highway projects, a most profitable field for post-war work would be in housing and in providing for terminals for automobiles and airplanes in a future transportation scheme. He gave data for St. Paul showing that the total parking places in the business center of the city—garages, parking lots and on-street parking—are just equal to the number of automobiles that bring people to work in the morning, leaving no space for those who come later to trade.

Transportation problems

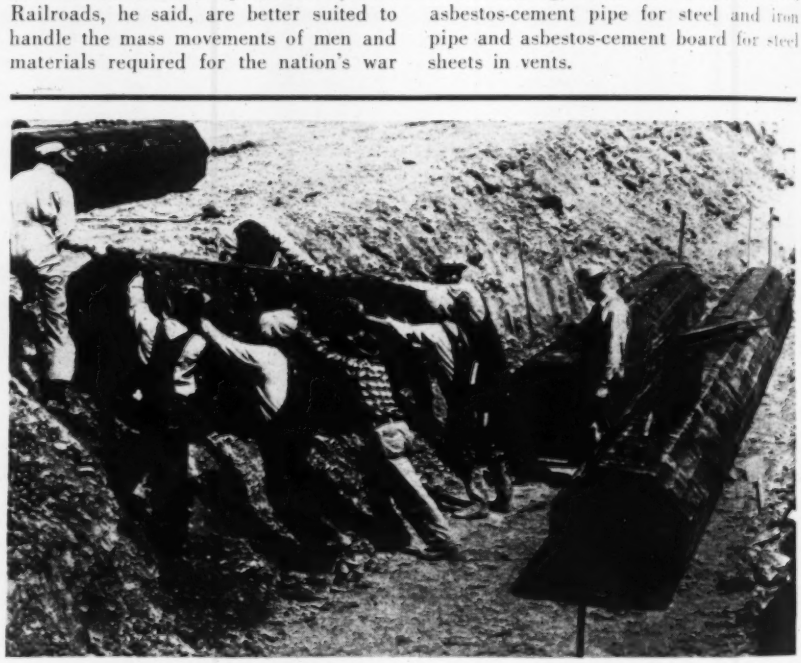
The convention was notable for the variety and value of the addresses at luncheon and dinner meetings. Of chief interest from an engineering viewpoint were those of Ralph Budd, president, Chicago, Burlington & Quincy R. R., and Major Lynn C. Barnes, area engineer, Twin City Ordnance Plant.

Mr. Budd centered his talk on the railroads because they are the backbone of the nation's transportation system. Railroads, he said, are better suited to handle the mass movements of men and materials required for the nation's war effort than are trucking companies, which has resulted in throwing a greater load on the railroads. At the same time this helps minimize the effect of the rubber shortage. Total car loadings are about the same as for the first six-month period of last year, but the monthly figures show an increase in the early months over last year. Now there is evidence of a reduction in the normal increase to a peak in the fall months. This, Mr. Budd said, is due to the sustained war effort which is flattening out the normal peacetime curve.

Passenger miles are approaching the all-time peak of 1920; in the south they have passed the peak record.

High tribute to the shippers was paid by Mr. Budd for the way they are releasing cars. The 1917 breakdown was due to the use of cars to store rather than move freight. In this war the situation has changed due to the cooperation of the railroads to meet the war demands.

Major Lynn C. Barnes centered his discussion of limiting the use of critical materials on construction of one of the new ordnance plants. The first unit of the plant under discussion was built before Pearl Harbor. After Pearl Harbor, by redesigning for an addition of the same capacity of the plant, very large savings were made in steel, copper and other critical materials through the substitution of mill-type construction for steel framing, wood for steel in sash, asbestos-cement pipe for steel and iron pipe and asbestos-cement board for steel sheets in vents.



Timber drain pipe installation saves steel

Workmen install a timber drain pipe—a development prompted by the nation's need to conserve steel—at an Army camp in the Southwest. The culvert or drain pipe shown above, of octagonal section, is fabricated from various sizes of lumber, according to load requirements, and is fastened together with wood dowels, thus eliminating all metal. Shop-assembled units are 12 ft. long.

This design of emergency drain pipe has been developed by the Armco Drainage Products Association, of Middletown, Ohio.

OBITUARY

Jacques N. Aggiman, 50, civil engineer and chief executive of the engineering and architectural organization of H. Craig Severance and Associates, died at Washington, D. C., July 22. A native of Turkey and a graduate of McGill University, Canada, he designed the palace of the Turkish president and many other buildings in Ankara, Turkey.

Willis Rodkey, an engineering employee of the Philadelphia Electric Co. for the past 25 years, died July 20 at Philadelphia, Pa.

John Coffee Hays, 59, civil engineer and executive vice president of Stone & Webster Engineering Corp., died July 21 in New York City. Mr. Hays had served as a major in the army during the first World War, having been constructing quartermaster at Camp Lewis, Wash.

Percy H. Bartlett, 69, retired engineer for the Philadelphia Electric Co., died July 24 at Philadelphia.

James F. Higgins, water engineer at the Orange, N. J., pumping station for 25 years, died July 21 at Orange.

Frederick A. Allner, 60, president and director of the Safe Harbor (Pa.) Water Power Corp., died July 18 at Baltimore, Md. He was an honorary life member of the Engineer Club of Baltimore.

Aaron Andrew Culler, 65, consulting engineer of Pittsburgh, Pa., died July 21 there.

Lee S. Busch, 54, civil engineer for the Indiana state highway commission, died July 20 at Indianapolis.

Richard James Whalley, 78, building contractor at Savannah, Ga., for 25 years, died July 23.

Sidney Ernest Lasell, 70, long-time resident of Oak Cliff, near Dallas, Tex., and associated with building construction in Dallas, died July 21.

Clarence Godfrey Swenson, 41, vice president of the Swenson Construction Co. of Kansas City, Mo., died July 23.

Harry B. Sharpless, contractor and builder of Bloomsburg, Pa., died July 25. He was 78.

Oscar Price Lane, 84, building contractor of Danville, Ky., died July 22.

August H. Riegel, 61, president of the Circle Construction Co., died recently at White Plains, N. Y.

Work to start on large Mexican laborers' colony

Construction of Mexico's largest workers' home colony will start within ninety days at Tacubaya, a Mexican City suburb. The colony is to accommodate 8,560 persons, and will cost about $1,850,000, provided by the federal government, Mexico City, the Labor Ministry, and private industry.

While the settlement will be primarily for employees of government war materials factories, it will also be open to workers employed in private industry in the sector.

Plans call for the erection of homes, schools and other structures on 165 acres.

Seattle makes second call for Ross Dam bids

The city of Seattle last week for the second time called for bids on construction of the second step of Ross Dam on the Skagit hydroelectric project, setting Aug. 6 as date for opening. Bids previously had been called for opening in June, but the call was cancelled (*ENR*, July 9, p. 62). The new call was issued after an A-1-A priority was secured.

Four contracts are involved in the $8,000,000 project. One calls for raising the concrete variable arch dam from El. 1360 to El. 1545 and the installation of penstocks; another for the furnishing of 437,000 barrels of cement.

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION volume for the week totals $259,800,000, an increase of 50 percent over the total for the corresponding 1941 week, and 75 percent above last week's total.

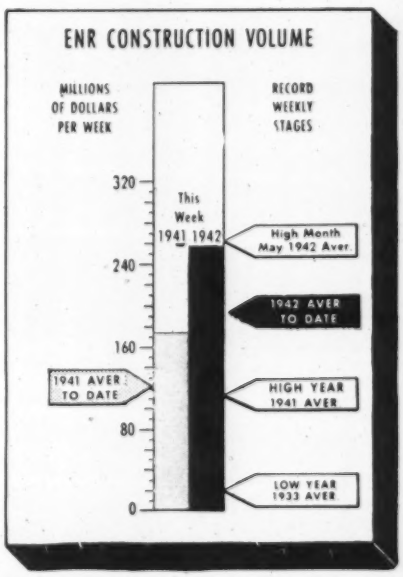
Public construction gains 55 percent over a year ago, and is responsible for the increased volume as private work is 0.5 percent under last year. Both public and private construction record increases over last week, the former up 79 percent, and the latter 36 percent.

The current week's total brings 1942 construction to $6,106,820,000, a gain of 61 percent over the volume for the 31-week period in 1941, and already in excess of the $5,868,699,000 reported for the entire 52 weeks of last year. Private work, $403,448,000, is 51 percent below a year ago, but public construction for the period, $5,703,372,000, is 92 percent higher due to the 145 percent increase in federal work.

In the classified construction groups gains over last week are in waterworks, sewerage, industrial, commercial and public buildings, earthwork and drainage, and streets and roads. Increases over the 1941 week are in waterworks, sewerage, industrial, commercial and public buildings, and unclassified construction.

New capital for construction purposes for the week totals $6,860,000. This compares with $73,716,000 for the week last year. The current week's financing is made up of $5,445,000 in state and municipal bond sales, $1,000,000 in RFC loans for public improvements, and $415,000 in corporate security issues.

New construction financing for the year to date, $9,500,250,000, is 90 percent higher than the $5,007,275,000 reported for the 31-week period last year.



CONTRACTS

(Thousands of dollars)

	Week Ending July 31 1941	July 23 1942	July 30 1942
Federal	$126,855	$128,487	$234,878
State & Municipal	31,272	8,717	10,034
Total public	$158,127	$137,204	$244,912
Total private	14,967	10,967	14,888
TOTALS	$173,094	$148,171	$259,800

Cumulative
1942 (31 weeks) $6,106,820
1941 (31 weeks) $3,800,066

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1941 31 weeks	1942 31 weeks
NON-FEDERAL	$939,886	$533,352
Corp. Securities	281,570	158,034
State & Mun.	304,035	164,199
U.S.H.A. loans	30,399	.....
R.E.A. loans	100,500	.....
R.F.C. loans	60,382	128,419
Fed.-Aid—Highways	163,000	82,700
FEDERAL	$4,067,389	$8,966,898
TOTAL CAPITAL	$5,007,275	$9,500,250

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	July '42	277.65	133.46
Building Cost	July '42	223.45	120.79
Volume	June '42	752.	330.

FHA MORTGAGES

	Week Ending July 26 1941	July 18 1942	July 25 1942
Selected for appraisal			
Title II	$30,509	$5,533	$5,871*
Title VI	$4,892	$12,412	$14,805*

* Subject to revision.

EDITORIALS

VOLUME 129 NUMBER 5

July 30, 1942

Behind the Midway Battle

BY ANNOUNCEMENT and subsequent agreement among all the experts, the Midway Island naval battle of June 3 to 6 was won by land-based American planes. Where did they come from? Obviously from Midway Island itself, otherwise they could not have pounced on the Japs so quickly after Navy patrol bombers gave the alarm. That land-based planes were present in sufficient force is a fact whose significance has so far been overlooked, for it means that Midway has been converted from a coral reef to a great fortress in less than three years. Back in 1939 Congress appropriated 4 million dollars for Midway facilities to be completed by August, 1942, but a good many contractors and engineers, particularly those engaged to do the work, know that Rear Admiral Ben Moreell, chief of the Navy's Bureau of Yards and Docks, accepted no such leisurely schedule. It was a drive and a push against time from the very beginning. Subsequently the initial appropriation was multiplied many times, and from the results of the Midway battle it is evident that most of this money must have been converted into air fields and seaplane and fleet facilities by June, 1942. Here was one case where "too little and too late" did not apply. While praise and credit is being passed around to the Army Air Forces, the Fleet Air Arm and the Marines, the vital contribution made by the Navy's Civil Engineer Corps and its civilian engineers and contractors should not be overlooked. By working punishing hours while the rest of us still thought the Japs were bluffing, they were making the Midway victory possible.

Waterway Traffic Charges

SUBMARINE ATTACKS in the Atlantic and congestion on the railroads are diverting to inland waterways some of the traffic that barge advocates have long claimed would be theirs if the old waterways were modernized and new ones built. Expenditure of considerable amounts of money by the Tennessee Valley Authority on new waterway terminals, reported in these pages recently, is a sign of this change; and with the completion of Kentucky Dam the modernized Tennessee River system will be opened for movement of large barges to the Ohio and the Mississippi Rivers. Now that this country has spent large sums on these waterways there use should be encouraged, but the shippers who benefit should be required to pay a fair share of the cost of building and maintaining them through some form of toll or tax. This nation's transportation system cannot be put on a sound basis while traffic over the inland waterways is heavily subsidized. If the transportation provided by the waterways really is cheap, then part of the saving should be turned back to the federal treasury.

Microphone Manners

THAT "fools rush in where angels fear to tread" is in a measure exemplified by the majority of engineers who step up to a public address system and, without the slightest knowledge of how to use this device, launch (or shall we say, plunge) forth. The intent of this comment is not to discourage the use of address systems at large meetings, but to urge that more care be exercised so that these devices are a help rather than a detriment to effective presentation of the spoken word. At least two considerations should be borne in mind: Loud speakers amplify speech defects; and secondly, the resonance of the system requires that words be spoken crisply. And the most important, the distance of the mouth from the microphone determines the clarity of what comes out to the audience. Engineers, as a group, have the reputation of being notoriously poor speakers; a microphone improperly used can do much to make this reputation secure.

Something is Missing

CANCELLATION of the Higgins shipbuilding contract calls attention to the difficulties that seem to beset proponents of new ideas that might help us in winning the war. But whereas Mr. Higgins, being a man of considerable initiative, and having an organization and some capital, was at least able to make a start toward putting his ideas of assembly-line shipbuilding into effect, the great majority of inventors who think they have something important to offer can make no headway in securing a proper audience.

What seems most to be lacking are investigational facilities and an official organization that will test new devices or methods to determine if they will meet the claims of their originators. In

peacetime, manufacturing companies will take on a promising invention, develop it and put capital into selling it, but now, having no customer but the government and not being able to get materials without priorities, such companies are effectively stymied. Much investigational work, of course, is being done by the eminent group of scientists under the National Research Council, but this is on projects proposed by official agencies. The lone civilian, with an idea, has no such facilities at his disposal. How, therefore can those who need the information know whether a proposal to use paper for concrete forms is as practicable as its inventor claims; whether a special type of clip would hold steel framework together as well as rivets or welds; whether a chemically-treated sand placed on roofs would stop and extinguish incendiary bombs; whether glass rods or fibers would serve as effective concrete reinforcements; or whether a method of using asbestos-cement pipe in lieu of steel for piles is practical.

There is no way, at present, to evaluate these and many other interesting proposals. It would seem that there is a missing cog in our war effort machinery that someone should find and put into mesh.

Camouflage of Industrial Plants

CAMOUFLAGE is a subject to seize the imagination, especially of those who like to experiment with form and color. As a consequence, the art of protective concealment has benefited from a wide variety of study, yet it also has suffered from a large amount of superficial experimentations. Too many camouflage "experts" have evolved, and too much has been said and written that can best be classified as hokum. There is urgent necessity for clearing up some of the resulting confusion that has swept the country.

Basic to an understanding of camouflage is recognition of the fact that its use on military objectives in forward zones is quite different from its application to the protection of industrial plants far from the battle front. Knowledge of the former is the function of specially trained units of the Army; while as to the latter, an appreciation of the possibilities and limitations of protective concealment is desirable for all who have to do with the construction or maintenance of industrial plants and essential public services. It is to provide the necessary background for such appreciations that a considerable part of this issue is given over to a special *News-Record* report largely based on data made available to its author by the Engineer Board of the Corps of Engineers.

In brief, this report shows that anything approaching complete camouflage of industrial plants will rarely be required, and that when it is necessary the decision will be made by the Army not by the plant owners or his consultants. The conclusion appears inescapable that the number of plants that will benefit from any kind of camouflage at this time is quite limited. This is not to say that the subject can be dismissed as unimportant; rather, it is to emphasize that a knowledge of the limitations as well as the possibilities of industrial camouflage is necessary if the almost hysterical expenditure of money on needless and ineffective camouflage that swept over England following Germany's first air attacks on that country is to be avoided should this country be bombed.

Another aspect of the matter is that knowledge of the simple ways in which the visibility of a plant from the air can be reduced can be put to good advantage in the ordinary maintenance of a plant and its surroundings, or in the designs for needed plant expansion.

Belief is current in some quarters that industrial plants of the future as well as dams, power stations, water-purification and sewage-disposal plants—and even our future towns—should be designed to minimize the effect of air raids at some remote future date. Some people have even proposed that future office buildings be designed to resist direct bomb hits. That such proposals, if they add materially to the cost or reduce the efficiency of any undertaking, are unsound would appear obvious when viewed only in the light of the increase in bomb sizes and in airplane range since this war began.

The only expenditures that appear justified today are those that will give some reasonable measure of concealment to existing structures or to new structures yet to be built as part of our war effort. Attempts to look far into the future in planning for protection of our industries or essential public services can involve only needless expenditures and waste of materials that are needed now to win the war.

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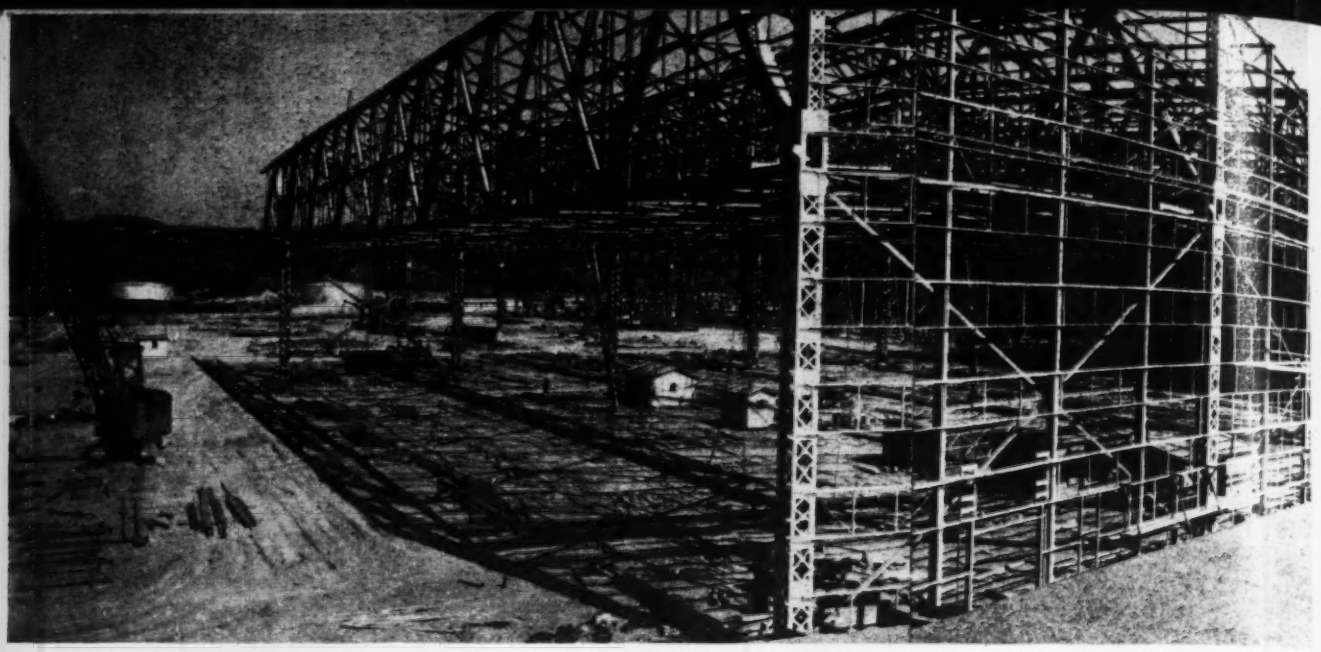


Fig. 1. One of the 300-ft. roof truss spans with its 64-ft. cantilever overhang (at far end) into the adjoining span.

A-Frames Aid Erection of 300-ft. Trusses

***Contents in Brief**—Based on experience with 300-ft. roof truss spans in other plants, timber A-frames were used for steel erection on a recent war factory in a highly effective manner. Trusses were designed with cantilever overhang to prevent stress transfer; suspended trusses are 172 ft. long. Close timing on erection schedules simplified handling 12,000 tons of steel.*

AFTER completing several other industrial plants involving steel roof trusses of 300-ft. span, the same organization recently has built a third structure in portions of which three parallel bays all have 300-ft. roof trusses. Refinements and methods of handling the steel, particularly in the use of A-frames that temporarily supported and facilitated accurate placement of the long spans, permitted rapid construction which would have reached the average rate of 200 tons per eight-hour shift, it is believed, if the steel could have been delivered to the job at this rate.

Because the footings for the columns that support these long spans are concrete slabs carried by 32 piles, the plan of using cantilevers and 172-ft. spans suspended in the central bay was selected rather than a continuous type of truss. Under the adopted design the structure is not sensitive to uneven settlement of the foundations. This same method of cantilever and center suspended span design also was used in a portion of the building where the main truss spans are only 150 ft., as well as in the floor system of second-story portions of the structure where in alternate 50-ft. bays (Fig. 3) a suspended beam 20 ft. long was introduced. This beam was actually hung from the ends of cantilevers with pin connections.

The contractor kept an expediter at the steel mill to follow through on a sequence of shipments that would get material to the job in the order in which erection was planned. Sidings at the site where the steel was unloaded were moved as the work advanced in order to make the steel storage location as convenient to the erection as possible.

The saw-tooth roof trusses, especially designed for low-slung railroad cars that gave a maximum clearance of 17½ ft. above rail top, made it possible to fabricate these 65-ft. long assemblies complete at the mill. They came loaded seven to the car, and to make sure that they would not shift in transit and thus endanger the predetermined clearance height they were held in place in the car by rods that had to be burned off.

The longest sections of steel shipped from the mill were 92-ft. lengths of bottom chords of the trusses. These large sections required three flatcars for delivery. Their weight, however, was only 10 tons as compared to the 13 tons of the heaviest column section whose length was only 55 ft.

All the steel was unloaded by crawler cranes, and practically all of the erection was done by two cranes with 95-ft. booms, these booms having been substituted for the dipper sticks of machines originally built as 1½-cu.yd. shovels. Both of these rigs, working together, were used to lift the 150-ft. trusses in that portion of the building where this was the length of the main span. The 300-ft. trusses, on the other hand, were all assembled in place, beginning with the bottom chords, which were supported on the A-frames.

There was very little margin between deliveries and demands for steel, and most of the time there was on hand a supply sufficient only for a few days work. At peak activity there were 12 gangs of riveters working six eight-hour shifts per week. These crews erected 768 tons of steel per week in the 150-ft. trusses and 814 tons per week as a maximum in the 300-ft. trusses. Had it been possible to bring in the steel more rapidly, it is believed that, with the necessary additional riveting gangs, an average rate of 1,200 tons per week could have been maintained. The total

amount of structural steel in the job was about 12,000 tons.

The roof truss system was figured for a live load on the roof of 25 lb. per sq.ft. Provision was made for a 10-ton crane of the monorail type at each panel point (22 ft. on centers), and these cranes will run entirely through the building, both in the 150-ft. and in the 300-ft. roof span sections. In the two-story portion of the building a 200-lb. per sq.ft. design live load was used for the second floor.

In the 300-ft. spans, the main trusses have a uniform depth of 34 ft. and are 65 ft. apart. Window sash was put in the verticals of the saw-tooth construction but for the present this sash is "glazed" with galvanized metal plate as a blackout provision.

The A-frame supports

An outstanding feature of this job is the design, construction and operation of the timber A-frames used for temporary supports under the 300-ft. spans. These frames were placed under main panel points, 44 ft. apart, and were set up in such a way that it was possible to control accurately the level of the A-frame top. This brought the bottom chord of the truss to exact height required by camber diagrams, which took into account the amount of settlement to be expected upon removal of the A-frames.

The A-frames, 45 ft. high, are designed for a 40-ton load. The framing was done very carefully to obtain a good fit for bolts and plates at each joint, thus to secure a minimum of compaction in the A-frame itself under load. The footing of each A-frame was carefully set by transit. By using three jacks, it was possible to adjust the height exactly to a predetermined level.

In preparing to set up an A-frame, the ground was first leveled and a layer of 4-in. planks was put down. On these, centered under the prescribed location for the A-frame, a pair of 10x18 timbers on edge, firmly fastened together with bolts and spacers, was carefully leveled. Centered on these timbers, and under the locations where the two batter posts of the A-frames would come, square steel plates about 1 in. thick were placed as bases on which to set the screw jacks. Between the heads of the screw jacks and a 10x18 (laid on the flat) that constituted the base of the A-frames proper, other steel plates

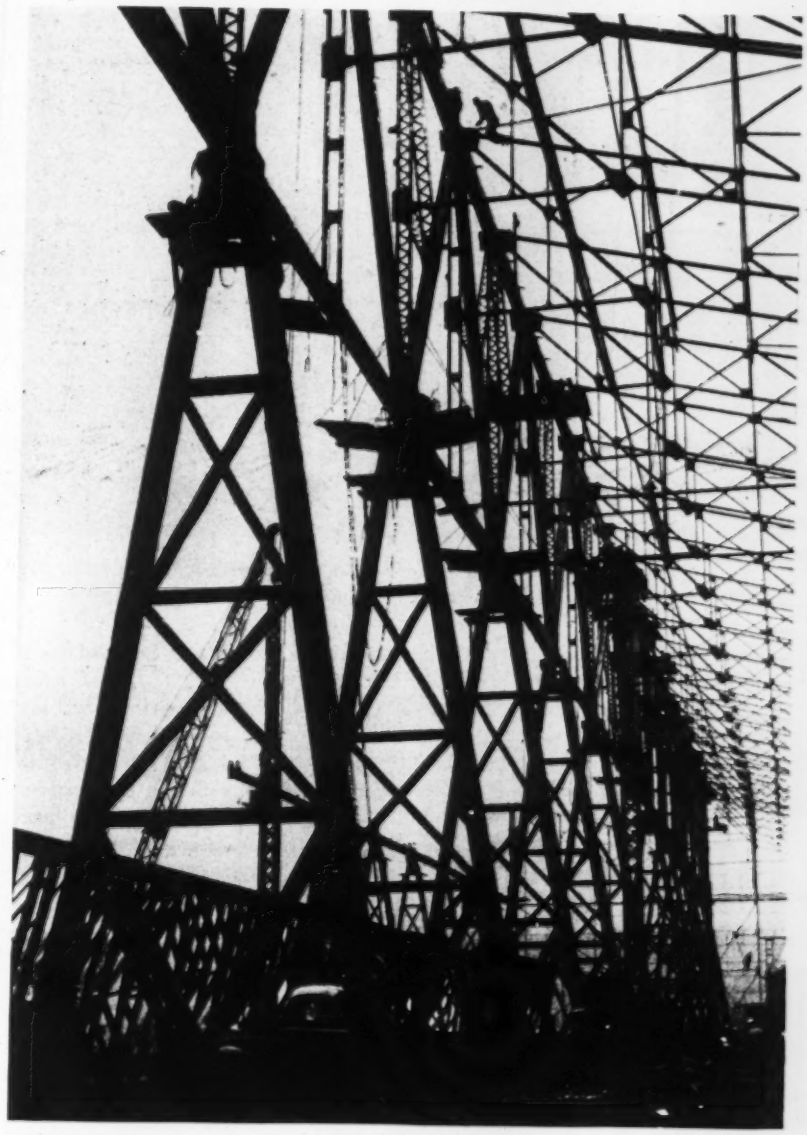


Fig. 2. Typical arrangement of A-frames, 44 ft. apart, that supported the trusses and aided erection during the construction operations.

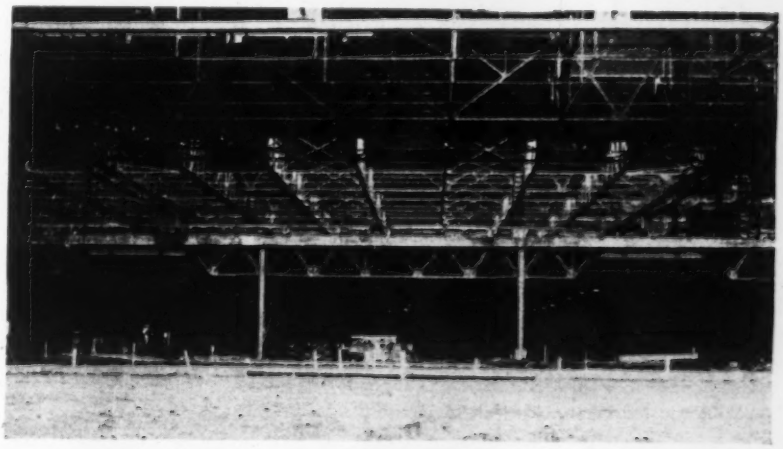


Fig. 3. Second-story floor system also uses a cantilever truss design but with a rolled beam section constituting the suspended portion.

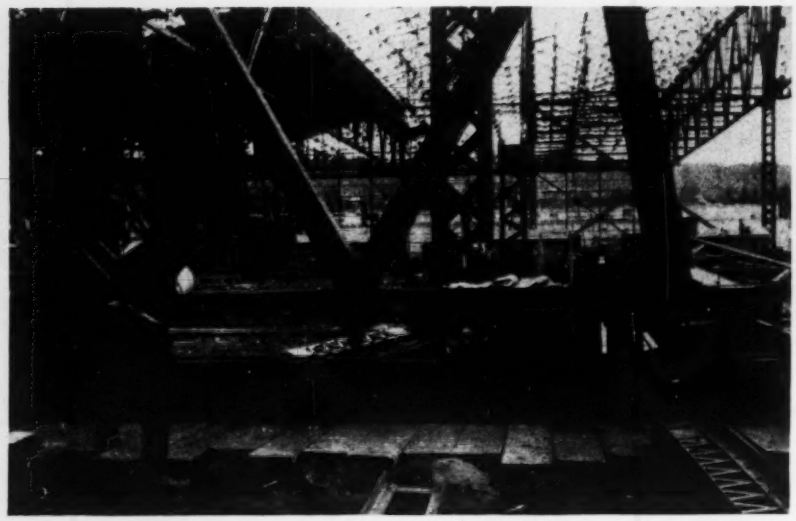


Fig. 4. Each A-frame rested on three screw jacks adjusted by hand. Diagonals meet over center jack. The jacks were set between heavy plates; wrenches that adjusted them had 8-ft. handles.

1 in. thick were used to provide proper bearing between the heads of the jacks and the bottom of the A-frame. Each of these upper bearing plates had a central depression made to fit the rounded head of the jack. This depression, which was kept well greased, prevented the head of the jack from working off center.

The jacks were adjusted by a crew of three men, each one with a specially built wrench, the handle of which consisted of an 8-ft. length of pipe. Equalizing the three jacks, so that the same load would be carried by all, was done by working the jacks simultaneously until the same strain was required on each wrench to move the load. On the heavy lifts, three men would sometimes be used on a single wrench.

When the exact prescribed level for each A-frame was reached, as determined by instrument, safety wedges were lightly tapped into place under the outer ends of the bottom timber of the A-frames. This prevented vibration from causing the jacks to work down out of prescribed position. The failure of one jack proved the worth of the safety wedges.

Before erection of the long spans began, the A-frames were set $1\frac{1}{2}$ in. higher at the center than was called for by camber diagrams. Before final riveting the jacks were let down so that only the prescribed camber remained. The resultant final position of the bottom chord was level, as planned.

The industrial plant described has been built by The Austin Co., to be used by an aircraft manufacturer.

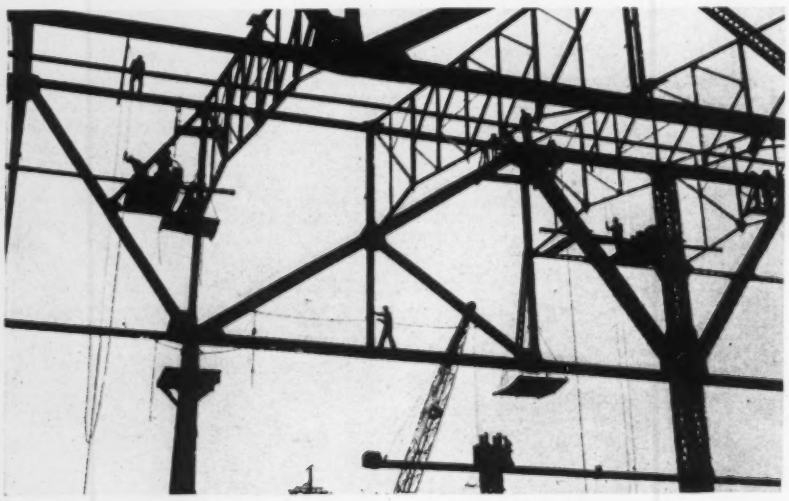


Fig. 5. From the steel column (right) a 64-ft. cantilever span extends to the A-frame (left center) where the 172-ft. suspended span begins.

Septic Tank Drains Are Not Clogged by Roots

Based on the report that roots seldom clog the effluent drains from a septic tank as they rather frequently do in ordinary sewer laterals, inquiry was made from a number of sanitarians as to why this is true. Confirmation was forthcoming promptly. The general belief is that even where roots have attempted to enter the outlets from septic tanks there has been no record of serious clogging. Rather, the roots tend to rot off and very rarely do they grow into or obstruct the drain.

The reason ascribed is that in order to grow and develop, roots and plants must have oxygen. In sewer laterals, the amount of oxygen present is relatively high. The more septic the sewage becomes, the less there is of dissolved oxygen and the less likelihood of root growth.

As a rule, in a drain close to a septic tank, there is little or no dissolved oxygen present, and hence this effluent will not support root or plant life. In loosely laid hollow tile or half-tile or in the "horseshoe-type" drains, oxygen can penetrate and here some plant growth may be expected, particularly some distance away from the tank.

Fig. 1. Following clamshell excavation of a 5-ft. depth of peat, bank-run sand and gravel make a foundation for a runway.

Building Airports on New England's Bogs

***Contents in Brief**—Construction of airports on bog lands in New England calls for excavation of the muck and backfilling with stable material. However, filling over the bog for safety bands outside the paved runway also is practiced. Where the soft material is deep, it has been found necessary to excavate with clamshell buckets for haul to spoil banks. Bulldozers are used on shallow excavation and some blasting is done to open ditches.*

AIRPORTS ARE BEING BUILT in New England on what has heretofore been considered waste bog lands. These areas generally have the advantage of being flat and free from outcropping rock but they require special treatment to make them stable. Most of the bogs are relatively shallow with solid material underlying them at varying depths. The difficult problem is handling of the peat to produce a stable and, if possible, an economical airport.

The best means of eliminating trouble is to dispose of the peat itself by loading and hauling from the site. This is generally done for at least the width of the runway paving. On one port the area outside the paved strip is not excavated but good sand and gravel fill is spread over the bog, and by its weight, combined with drainage, forces the water out, permitting the fill to settle and, after a time, to become stable.

The Corps of Engineers of the Army is building airports on such sites at Bedford, Mass. and Norwood, Mass., both near Boston, for the Civil Aeronautics Authority. The peat and general site conditions differ widely and illustrate the methods adopted for construction in bog areas.

At the Bedford airport, good loam and topsoil about 8 in. deep covered one-third of the site; 12 to 24 in. of peat covered another third; while the rest of the area was under 3 to 9 ft. of peat. The entire area is underlain by about 8 in. of a reddish-brown sand, 12 in. of a dull-gray sand, and then a lighter sand becoming increasingly white as the depth increases to 10 ft. or more, below which is gravel. All of the layers of sand are stable material, satisfactory for use in filling. The runway elevation of the field was determined by the level necessary to give a balanced cut and fill from the sand.

Drainage of the field by excavation of the permanent open ditches and small auxiliary trenches to drain stagnant surface areas was found effective in lessening the difficulty of traversing the bog. The ditches were cut with dragline buckets handled by cranes operating over timber mats to prevent their sinking into the soft ground. Where topsoil or loam was available it was hauled by carrying scrapers to storage piles, from which it was later returned for topsoil on the safety bands paralleling the runways. Peat of the proper age and condition for topsoil fertilizing was saved and stored in the same way.

Where the peat deposit was shallow it was pushed by bulldozers into windrows for clamshell bucket loading for haul to waste banks. In areas that could be completely drained, the bulldozers were used to clean the entire area down to the sand. Where the peat deposit was deep the excavation was done entirely by clamshell or dragline buckets. The engineers favored the use of the clamshell bucket since it was possible to dig out as far as the boom length permitted, then to push the fill out with a bulldozer and advance the crane with full assurance that no peat was left in the fill. The contractor preferred the dragline as greater yardages could be moved with the same equipment. With the drag-

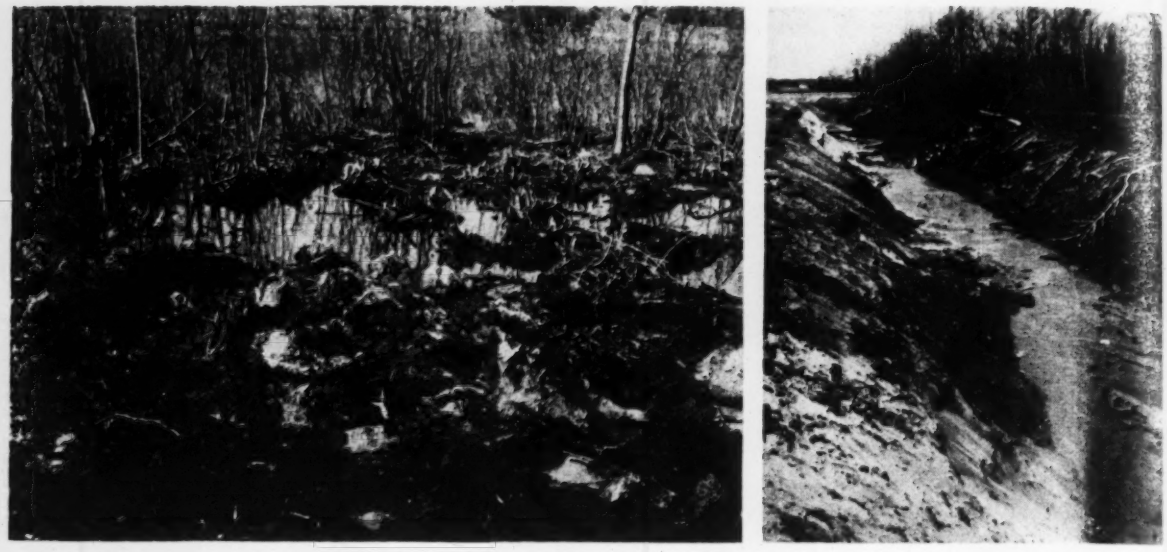


Fig. 2. Typical of undrained New England bog areas on which airports are being built. At right is a section of ditch prepared by blasting with charges of 32 sticks of dynamite placed at 4-ft. intervals along the center line.

bucket pulling to the base of the advancing fill for loading, it was difficult to be sure that no peat was left that might cause soft spots in the runway.

Material for the fill came largely from excavation on the field with supplemental borrow from a pit opened up to supply sand and gravel for a base course. The fill was made in not more than 8-in. layers, it being found that four passes of the treads of a 10-ton tractor satisfactorily compacted the cohesionless material.

Open ditches drain the bog

Drainage is of utmost importance in this soil as the level bog areas surrounding the runways retain large quantities of water. Permanent open ditches are maintained along each side of the 500-ft. wide landing strips and are built to a 1 on 2 slope that has come through the first winter in good condition.

Blasting was used for opening a ditch in one area where the bog was deep and it was impractical to move equipment in to load and haul the peat. About 32 sticks of dynamite per charge were used at 4-ft. intervals along the center line of the trench and 2 ft. below the desired bottom elevation. Waiting for a brisk wind from a direction that would carry the flying material to one side of the trench, instead of along its length, the ditch was satisfactorily blasted open, almost exactly to a 1 on 2 slope. The wind dispersed the material without creating a windrow, which might make sufficient surcharge to cause sliding of the unstable bank.

Along each side of the 150-ft. wide runways (Fig. 5 top), excavated trenches filled with gravel carry surface drainage and groundwater to open-joint concrete pipe that discharges into the open trench along each outside edge of the 500-ft. wide flight strip. Water falling on the area outside the runways is expected to flow directly to the open ditches.

A 6-in. depth of selected gravel, which compresses into a stable soil, is placed over the sand fill for the width of the runway to be paved. This is compacted with sheepsfoot rollers and brought to plan shape with a patrol-grader and rolled, scarified lightly and rerolled with a three-axle roller.

The wearing surface on the runways is a 3½-in. thick bituminous concrete plant mixed at a nearby gravel pit and placed hot over a primer coat of thin bituminous material. The paving course contains 5½ percent asphalt and 5-7 percent limetone dust with the rest of the material coming from the local pit.

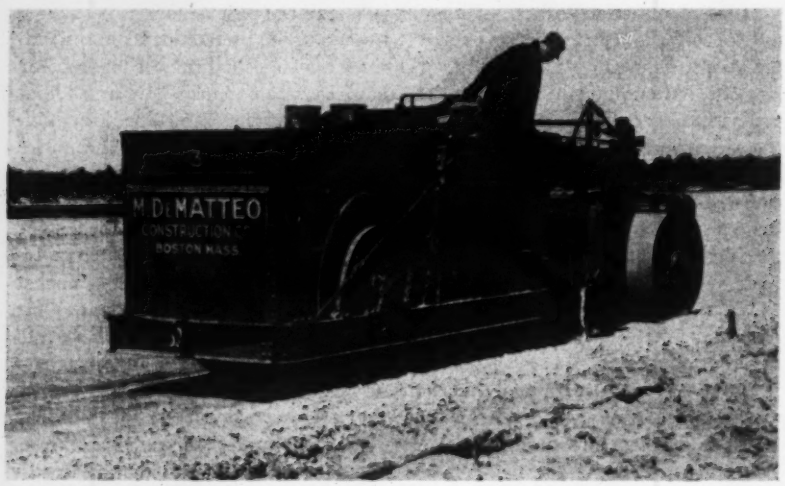


Fig. 3. A level runway base is assured by this three-axle roller.

Fill over the bog

The other of the two airports (at Norwood) is substantially different. The entire area is level and a uniform 5-ft. deposit of peat lies over a sand subsoil. Here the procedure adopted is to remove the peat for a width of 170 ft. under the 150 ft. wide runway, then backfill with sand. The peat is excavated by clamshell-bucket, trucked to a nearby area and dumped temporarily. It is expected that considerable saving in hauling costs will be realized by permitting the water to drain from the peat and reloading it

for haul to a distant waste bank. There is a possibility of disposing of some of the material, after it has drained, for fertilizer use.

The sand for fill is dumped from trucks and pushed out by bulldozers (Fig. 1) advancing the solid fill so that the crane can reach to make another cut. The first fill in the excavated area is just above the level of the standing water; the sand is consolidated by inundation and by travel of the bulldozer. Above this level the fill is placed in 8-in. layers to a total depth of 8½ ft. to bring the surface 3½ ft. above the original bog.

Outside of the 170-ft. wide section, for the total width of 500 ft. of the flight strip, the sand fill is dumped on the bog and allowed to settle as it will. The land is cleared of the existing scrub growth with all bushes closely grubbed, stumps cut close to the ground and all brush burned.

The fill varies in thickness to give a slope to the finished surface. About 5 ft. of sand is placed over the peat near the runway side (Fig. 5 bottom) diminishing to 2½ ft. at the outer edge of the 165-ft. width on each side of the runway. The weight of the superimposed fill is expected to compress the bog 1½ ft. near the runway and about 1 ft. near the outer edge.

Use of the brush as corduroy over the swamp is not permitted as it has been found that highway fills over corduroy on bogs have a tendency to always stay alive and have troublesome movement. Where corduroy is not used, and good fill material is placed directly on the cleared bog, the area becomes stable in two or three years and gives no further trouble.

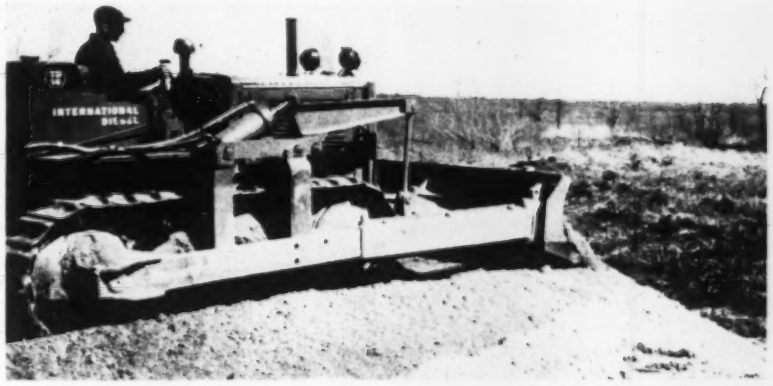


Fig. 4. Sand is spread directly over the bog on safety bands outside of the runway. Compaction squeezes out the water and the fill gradually becomes stable.

Drainage on the Norwood field is somewhat different than that previously described at the Bedford airport. Open side ditches paralleling the runways on either side are located 25 to 40 ft. beyond the edges of the sand fill dumped over the bog. The ditches have sides on a 1 on 3 slope to insure their remaining open in the soft peat. Subsurface drainage along the runway area is in closed-joint pipe that carries only the surface water collected by catchbasins. Groundwater nearly to the surface makes it impractical to attempt to drain the subsoil. Here again early drainage of the site is used to assist in making a workable area of the bog.

About 600,000 cu.yd. of earth are necessary for construction of the two 4,000-ft. long, 500-ft. wide flight strips of the Norwood airport. All of the material is borrow and is hauled about two miles. Runway surfacing will be similar to that formerly described with a stabilized sand and gravel base and a bituminous surface.

Contractor on the Bedford airport is M. De Matteo Construction Co. of Boston, for whom Frank Tupper is superintendent. R. B. Nisbet is resident engineer for the Corps of Engineers. On the Norwood airport Peter Salvucci is contractor and Elliot C. Farwell is in charge for the Corps of Engineers. A. J. Kelly is field supervisor on both jobs and Zaven Malkasian, assistant operations officer, is in general charge of all Civil Aeronautics Authority airports for the Corps of Engineers under Col. L. B. Gallagher, district engineer at Boston. The CAA is represented on this work by E. Fletcher Ingalls, district airport engineer.

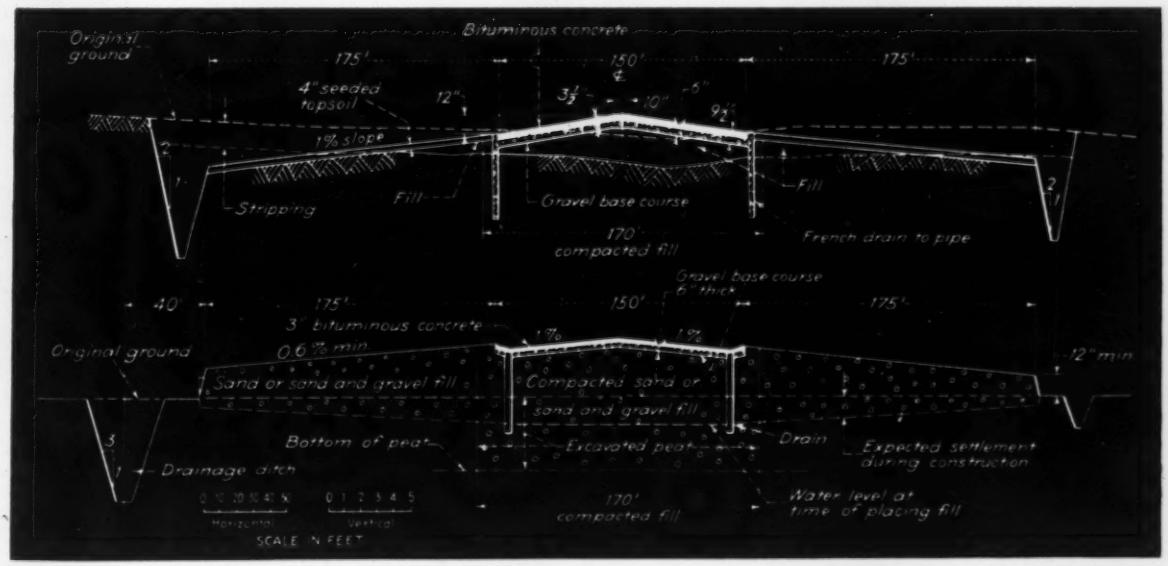
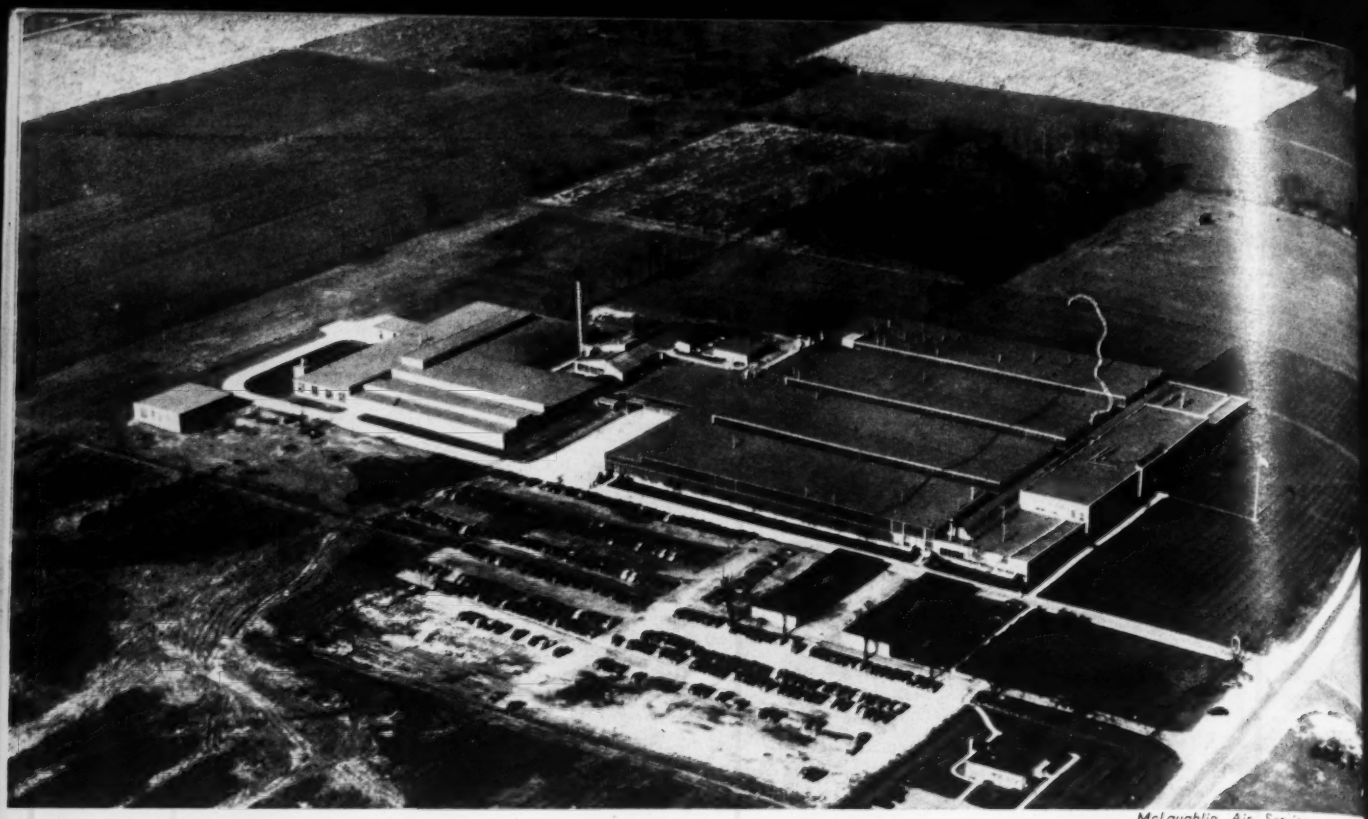


Fig. 5. Bedford airport (above) has the peat excavated from the entire width, while the Norwood field (below) depends on drainage and compaction for stabilizing the unexcavated soft material outside the paved area.



McLaughlin Air Service

Fig. 1. Light-colored walls, concrete service roads and parking lots make industrial plants conspicuous from the air.

Protective Concealment for Industry

V. T. Boughton
Associate Editor, Engineering News-Record

***Contents in Brief**—Most military authorities hold that industries in this country will be subject only to bombing attack from high altitudes, hence elaborate forms of camouflage such as are used in areas subject to close observation are not necessary. Many plants can be given a reasonable amount of concealment by toning down light-colored surfaces on the buildings and areas around them. Complete concealment is called for only in the case of a few vital industries in exposed locations. Camouflage of dams, power stations and other utilities seldom will be warranted.*

AN AIR ATTACK on any part of this country, even though it later proved to be only a "token raid" such as military authorities declare must be expected at any time, would bring widespread demand for some form of protective concealment for our vital industries and services. That was the reaction in England to the first German raids on that country, and the end result was the waste of millions of dollars in needless, hastily improvised and ineffective camouflage.

That there is need for camouflage of many plants vital to the nation's war effort is recognized by War Department officials, but they are anxious to avoid waste of money and materials on unnecessary or ineffective attempts at protective concealment. To that end the department has inaugurated an educational campaign centering around courses in camouflage being conducted by the Engineer Board of the Corps of Engineers at Fort Belvoir, Va., where engineers from district offices of the U. S. Engineer Department and certain key men sent by the Office of Civilian Defense are subjected to an intensive two weeks of camouflage training.

The purpose of this article is to aid that educational campaign by placing before the owners of industrial plants, their engineers or engineering and architectural consultants some of the facts necessary to a sound approach to industrial concealment. The article is based on information made available to the editors of *Engineering News-Record* by the Engineer Board, including the documents that formed the basis of the pamphlet "Protective Concealment" issued by the Office of Civilian Defense earlier this year.

A factor adding to public-misunderstanding of the possibilities, as well as of the limitations, of industrial camouflage is the growing number of self-styled experts in camouflage who make exaggerated claims as to what can be done in the way of protective concealment. For that reason, engineers of the War Department stress the importance of not making commitments for the camouflage of manufacturing plants or other structures without first consulting either the local Office of Civilian Defense or the local district engineer of the Army. All the district offices now have

either a passive defense section or a camouflage section in which are men trained by the Engineer Board who can advise as to the need for camouflage and as to the adequacy of proposals for protective concealment of any plant.

Little early work

Until recently, camouflage of both military and civilian objectives of enemy air attack in this country was a neglected branch of military science except as applied to a few types of purely military operations. Cantonments stand out as a most conspicuous example. In the rush to get them built, little thought was given to even the fundamentals of concealment such as preservation of standing trees, avoidance of regularity of pattern and dispersion of structures. Early airports suffered from the same defect, but in more recent months there has been a radical change in that field of work.

Opportunities to facilitate protective concealment similarly were overlooked in constructing new plants for war industries. Buildings were designed and plants laid out with little or no thought to the question of whether the type of structure, or layout of the plant would be adaptable to some form of concealment from air observation. Even the possible need for blackout of the plant often was not given more than a passing thought, with the result that in many plants saw-tooth roofs, built to provide a maximum of natural light, are now having their glass covered over to keep the night lighting from being seen.

These same saw-tooth roofs, no longer serving any useful purpose, now present the engineer or architect who attempts to design protective concealment for the plant with one of his most difficult problems. Speed was the controlling factor in the days when those plants were built, hence it well be said that the cost of

Fig. 2. The simplest form of camouflage consists in toning down bright colored or highly reflective surfaces to make the whole plant blend with its surroundings. The plant selected for these sketches is that shown in Fig. 1.

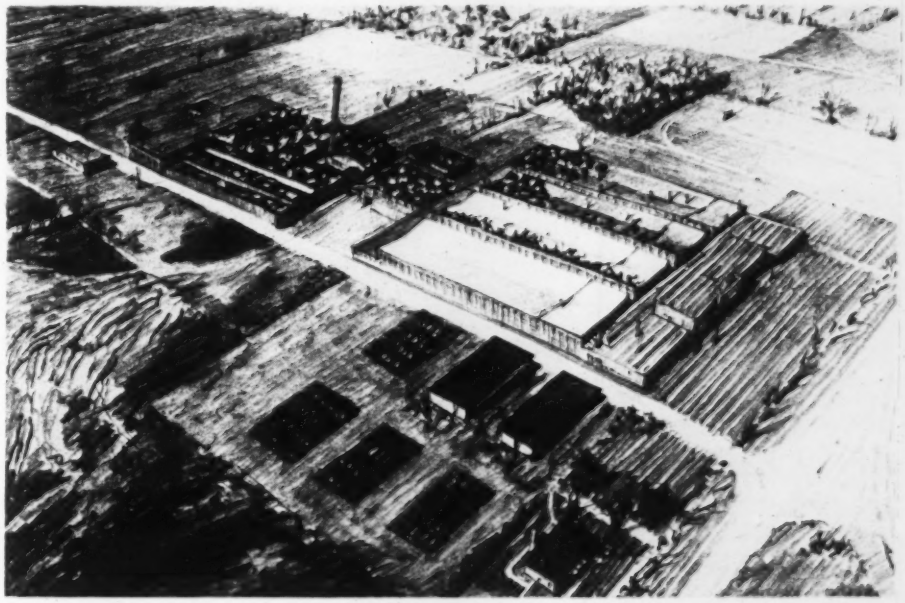


Fig. 3. Where more concealment than that shown in Fig. 2 is needed, colors and patterns of adjoining fields or woodlots are reproduced on roofs. Planting of trees (not shown) or even dummy trees can be used to conceal regular shadows.

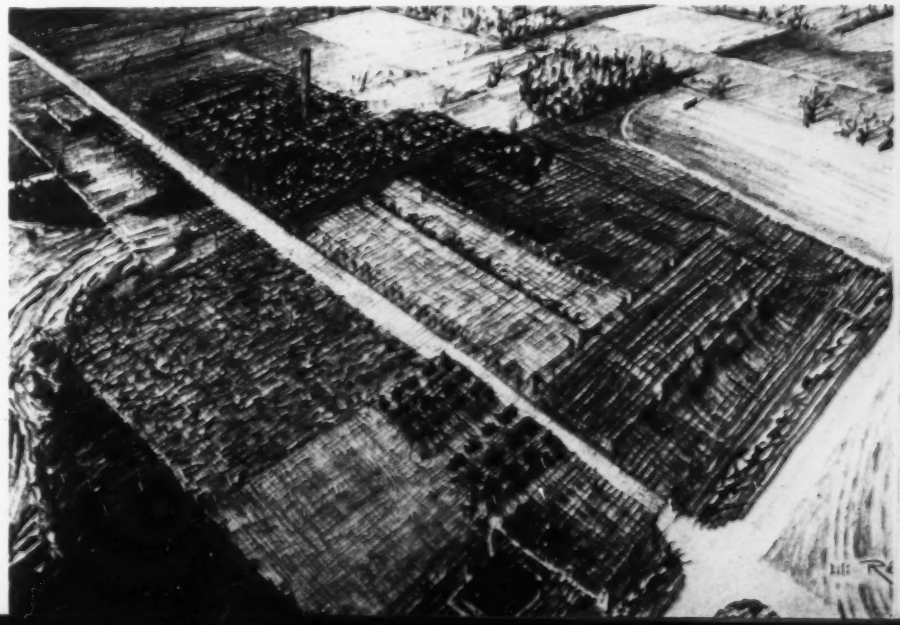


Fig. 4. (Right). Complete concealment seldom is justified. When required, it is provided by a system of nets stretched above the whole plant on which deceptive patterns are worked out in colored garnish. In this sketch the patterns were left purposely thin to show the buildings, which would be entirely concealed in actual work.

Sketches made for Engineering News-Record by Lili Rethi

McLaughlin Air Service

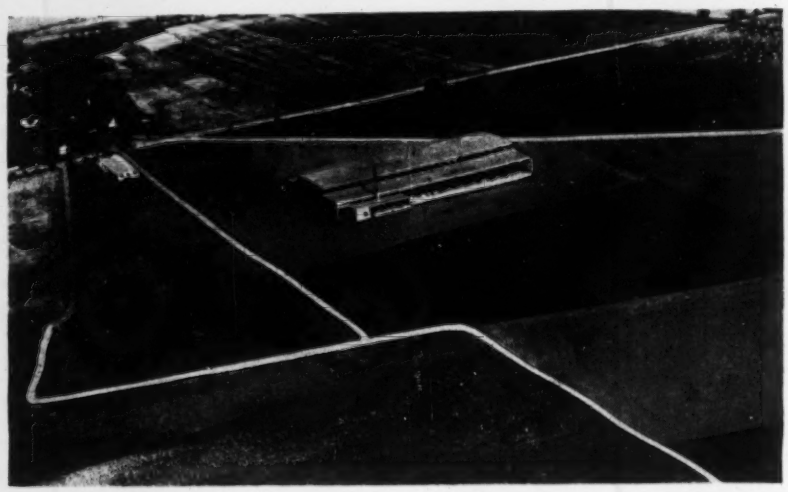


Fig. 5. To indicate how a high degree of concealment can be provided by proper attention to the grounds around a plant, the lower photograph has been retouched. In this type of concealment, unused areas are planted to grass or farm crops and areas around the plant are darkened with cinders or by bituminous spray.

concealment work now being undertaken can be charged off as part of the cost of the unbelievable record of tank and plane production that has been chalked up to the credit of all concerned.

Conditions now have changed. A large amount of study of protective concealment for the more important military objectives such as airports and for some vital industries is now on the boards.

Conditions to be met

The type of camouflage or protective concealment to be applied to any given installation, be it military or civilian, depends on the type of air attack to which the installation may be exposed. Thus the camouflage of a field gun, relatively close to the front line where it will be the object of frequent and detailed study by enemy observation planes and may be subjected to attack from low-flying planes, must be much more complete than the protective concealment applied to a factory far behind the lines and subject only to infrequent observation from planes flying at a high altitude.

Precision bombing, which is the only type against which camouflage is effective, must be carried on in daylight hours. It is done generally from altitudes of 18,000 to 25,000 ft., even from 30,000 ft. These high altitudes reduce the size and sharpness of the target but they also increase slightly the time available to the bombardier for locating his target and getting it properly placed in his bomb sights.

Military authorities are generally agreed that air attacks on this country, if made, will be made by planes flying at high altitudes, also that bombers will not have the benefit of recent air photographs of their objectives. Such knowledge as they will have will be from a study of maps and air views taken before the war, supplemented by such information as to the location of vital war industries as may have been obtained for them by spies. This means that the bombardier must seek out the approximate location of his target by the aid of easily recognized landmarks, and then must find the target itself by direct observation through his telescopic bomb sight in the few fractions of a minute that are at his disposal due to the high speed of his plane. The speed with which he must act is clearly illustrated in Fig. 6, which is reproduced from one prepared by the Corps of Engineers. Landmarks may be bodies of water (which are the most difficult to obscure), highways, railways and towns; and as the object is approached, road intersections, bridges, stacks on power plants or big gasholders. Anything that succeeds in confusing the bombardier in locating his target, therefore, reduces the chance of his releasing his bomb at the right instant, resulting in a probable miss, or requiring a return trip with the greater risk of attack from defending forces.

Amount of concealment

Except for a few vital war industries located in exposed locations, complete concealment is not considered necessary to meet this type of attack successfully, so far as this country is concerned. Also, because the observation of potential targets will be very limited and must be made from high altitudes, refinements called for in regions subject to close observation are not required.

Concealment policy

No policy with respect to industrial concealment has been laid down by the War Department, nor have zones of vulnerability been defined. To the greatest extent possible, decision on the amount of protective concealment that should be undertaken is being left to the regional staffs of the Office of Civilian Defense, who work in close cooperation with the staffs of the district engineers and the corps area commanders.

It seems quite probable that no plant owner will be called upon to decide the extent to which his plant should be protected. Where a plant

is so vital to the war effort as to call for complete concealment, the War Department will make that decision. In cases where the War Department has ordered concealment work undertaken, it is bearing the cost of the work, and exercises control over the type of concealment through the local district engineer. Detailed design can be made by outside consultants or by the company's own engineers, as desired.

Where the individual plant owner, his engineer or architect, can be of most help to the War Department is in the matter of recognizing those factors that tend toward making a plant conspicuous from the air and avoiding them whenever possible in making changes in the exterior of the plant or in its surroundings. This is especially true in the case of new plants. Correct application of knowledge that now is available through the district offices of the Corps of Engineers can make a new plant difficult of detection from the air and at only a small increase in the total cost of the project.

Types of concealment

Three principal types of concealment are employed for industrial plants. They are illustrated in a very general way in Figs. 2, 3 and 4, which are sketches of the plants shown in Fig. 1. Fig. 2 shows the simplest and most widely applicable type of concealment, which can be applied at no great cost to the owner. It consists in reducing the visibility of a plant by toning down bright colors, eliminating highly reflective surfaces such as glass in skylights, and giving the whole plant and its approach roads or parking areas a uniformly dull color that blends effectively with the surroundings.

The second stage of concealment is a form in which abnormal or sharply contrasting colors, painted patterns, plantings, and even some dummy structures are used to deceive the air observer (See Fig. 3). Such concealment costs more and calls for much more skill in its design and in the specification of color than is required for the first type.

The third type is generally called complete concealment. It corresponds most closely to the type of camouflage used by combat forces to conceal guns and equipment. As previously noted, it is applied only to industrial plants in exposed locations that are considered by the War Department to be vital to the nation's war effort. The basic plan, as in combat work, is to cover the entire plant with a system of nets on which deceptive patterns are reproduced. This type is indicated in Fig. 4.

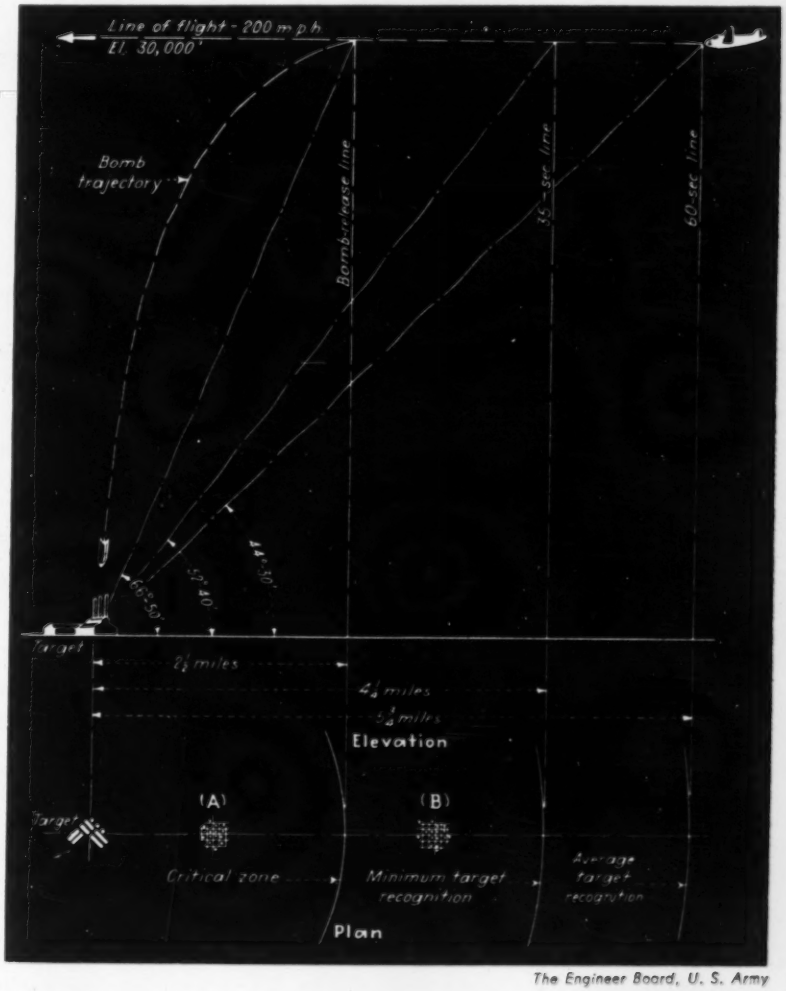
Toning down colors

How concealment through the simple expedient of toning down bright colors is accomplished is further illustrated in Fig. 5. That plant, in itself, would not have been a conspicuous object on the landscape had it not been for the leveling of the whole lot and the spreading of spoil over an adjoining cornfield. In its present state, the plant is a conspicuous object from even a high altitude.

How such a plant can be made less conspicuous from the air is shown in the lower section of Fig. 5, which is a retouched photograph. Covering the light soil around the plant with cinders, or putting unused areas back into cultivation by planting them to grass or grain, are simple ways to eliminate the telltale signs of new plant construction. Concrete walks and roads can be toned down with bituminous sprays, dyes or cheap paint.

Parked cars

Large numbers of parked automobiles are a clear sign of a busy industry, hence much thought has been given to methods for making them less conspicuous from the air. Parking cars on darkened areas is the simplest way, but where the number to be concealed is not large, and where trees or wooded areas are found close to the plant, parking them among the trees is most effective. However, opportunities for this type of treatment are limited, especially at large plants. Parking automobiles on



The Engineer Board, U. S. Army

Fig. 6. Military authorities anticipate that any bomb attacks on this country will be made only from high altitudes. Guided by landmarks A and B, the bombardier must see his target at least 4¼ miles away in order to release his bomb in time to hit his objective.

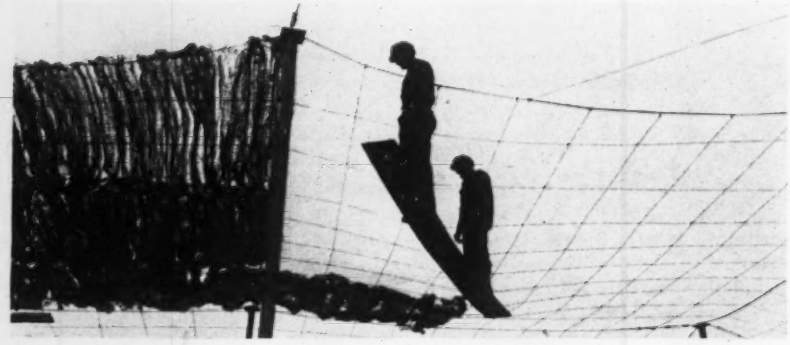


Fig. 7. Applying garnish to camouflage nets, an expensive type of concealment reserved for only the most exposed and vital war factories.

darkly painted rectangles that create the impression of small buildings when viewed from a high altitude has two effects: it makes the cars less conspicuous as cars and, by creating the illusion of small buildings, diverts attention from the larger structures. This form of treatment is shown in Fig. 3. Erection of nets to screen parked automobiles from air observation would appear to be justified only at plants where complete concealment is called for by the War Department.

Toning down road colors

Concrete or gravel roads can be toned down to blend with adjoining landscapes by the use of bituminous sprays such as are employed for curing fresh concrete, the amount of oil applied depending on the depth of color desired. There are also sprays on the market that can be used to dye the surface of concrete where color harmony closer than that provided by bituminous oils is desired. The same methods can be applied to airport runways or to concrete-surfaced parking areas. Cinders can also be used to darken parking areas.

In some locations, asphalt and bituminous surfacing on roads or runways will be too dark for proper blending. Such roads or runways can be made lighter by the application of a bituminous "tack coat" over which sand, stone chips or even sawdust can be spread in sufficient quantities to get the desired color effect or tone.

New concrete can be darkened by addition of small quantities of lamp black to the cement during mixing. Similarly, new bituminous surfaces can be colored while the surface is still fresh by dusting with cement, sand or stone chips.

The success of methods employed in the second and third stage of protective concealment rests primarily in the limited time that the bombardier has in which to find his target. Anything that confuses or deceives him delays his action, and, if the delay is long enough, the target is passed over or is missed by a bomb released too late. Regardless of the mechanical and photographic aids at the disposal of the bombardier, in the end he has to depend on his own eyesight to find the target.

This is why forms of camouflage that would provide no real concealment under close aerial observation can be used successfully for concealment of plants subject only to observation by the bombardier of an attacking force, or possibly to hasty observation from high altitudes.

Deceptive coloring

For the second type of protection, more or less crude coloring is used to produce effects corresponding to the pattern of the surrounding terrain. Contrasting colors are used to break the outlines of buildings or to make their shadows less regular. Planting of trees and shrubs may be resorted to for accomplishing the latter purpose.

The second stage is shown graphically in Fig. 3, in which it can be seen that this stage goes beyond the blending stage to introduce effects that deceive or distract the observer. The type of treatment depends both on the form of the structure to be concealed and on the surrounding terrain. If the plant is in a rural setting, colors and patterns of the adjoining countryside are introduced; if the setting is in a city, forms and colors are modified accordingly to meet these conditions.

In its simplest form, in a rural setting, the pattern of the surrounding field is carried over the roofs of the buildings by painting. Thus part of a roof may be painted to represent a grain field, while an adjoining section may be colored to represent a woodlot or an orchard. New roads that have been relocated to pass around the plant are obscured by dark coloring, and the lines of the old road are reproduced by painting across the top of the building. In a region having a definite rectangular pattern, such as is generally the case in open farming country, the rectangular forms of large factory buildings are not as difficult to conceal as they are in a region lacking such rectangular patterns.

Shadows

Shadows represent a major problem in protective concealment. They can be broken by skillful coloring of the ground on which they fall, or if they fall on a roof, by breaking the pattern of the area involved. Where higher costs are warranted, shadows can be broken by planting or by the use of camouflage nets extending out from the top of the shadow-casting wall at an angle sufficiently flat to eliminate any shadow.

Tall stacks and elevated tanks cast long moving shadows that are most difficult to conceal, though the tanks and stacks in themselves are not nearly as conspicuous from the air as they are from the ground. Because their shadows swing in a wide semicircle from dawn to dark, concealment of the shadow calls for exceptionally skillful camouflage treatment methods.

Deceptive highlighting

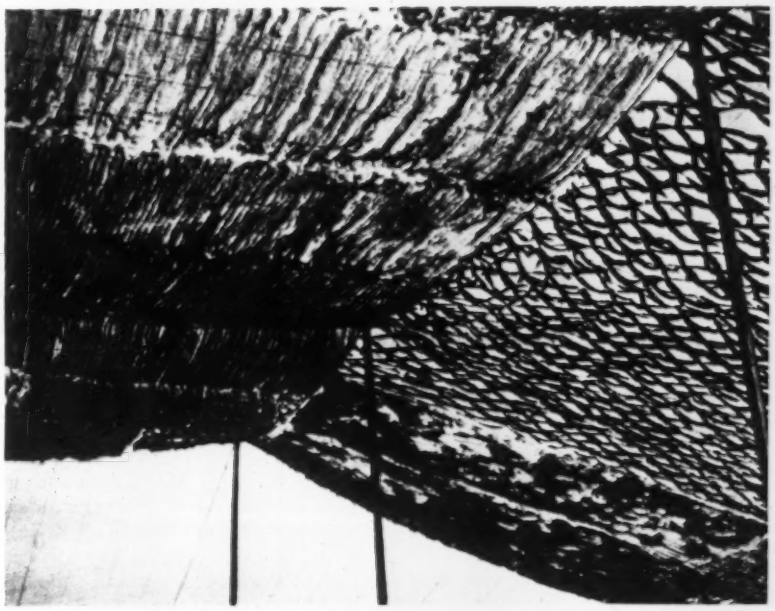
One technique that is used where a number of regularly spaced buildings should be concealed is to tone down the coloring of most of the buildings to the closest possible harmony with the ground around them and then to paint a few of the structures with conspicuous light colors. This makes the latter structures stand out as a few scattered buildings, thus distracting attention from the many other structures in the group. Viewed from high in the air—where haze and distance are major factors—this treatment is quite effective.

Complete concealment

Complete concealment is accomplished by stretching wire nets over the buildings, the nets being covered with "garnish," which is colored to reproduce the pattern of the sur-

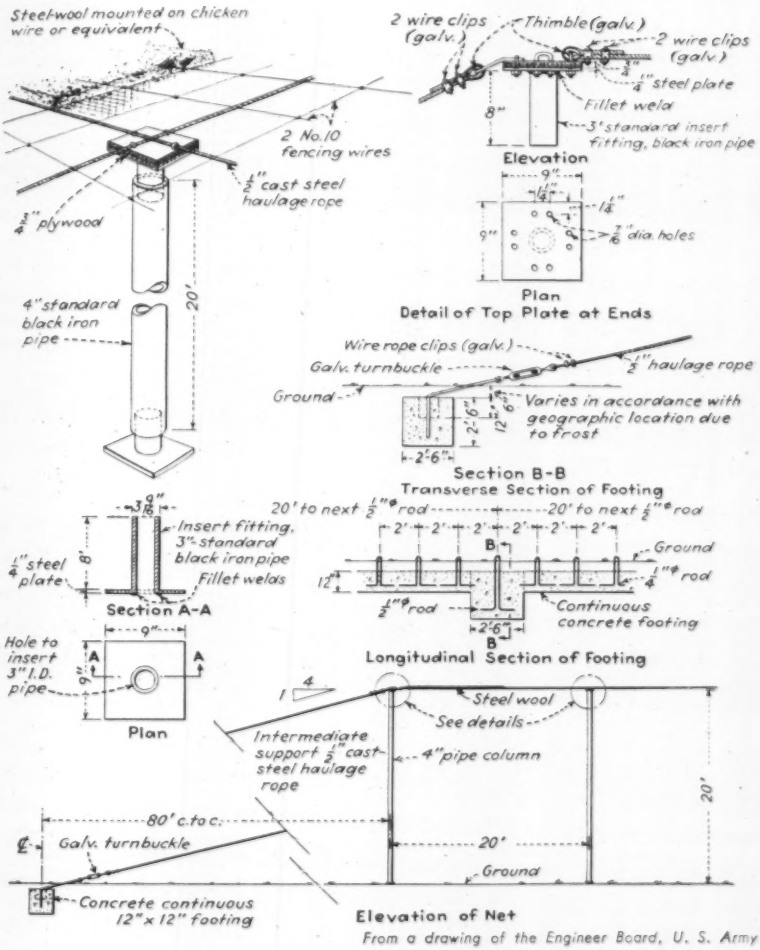
rounding region, be it cultivated fields, orchards, or the scattered houses and garden spots of a rural community. This reproduction of the pattern of the surrounding terrain is much the same as that employed in the second stage of concealment. However, here, the pattern can be reproduced much more effectively on the wide and relatively flat expanse of the camouflage nets where no shadows interfere with the work.

Design of supports for nets suspended above large buildings calls for skill similar to that of the suspension bridge designer. The nets must not rest on the roof of the building, but must be supported by a framework above them because part of the value of this system of concealment is the effect of depth produced by openings left in the garnish that is woven into the nets. Metal nets must be used for industrial work because the fiber nets used in military camouflage lack the strength and permanence required. Welded reinforcing mesh, fence wire or chicken wire are most commonly used. The net system also must be strong enough to support the weight of the garnish when wet, the weight of snow in northern regions, and the weight of men working on the net system.



The Engineer Board, U. S. Army

Fig. 9. Skill in the use of garnish materials is essential to effective camouflage. Here shown are steel wool at the left and osnaburg.



From a drawing of the Engineer Board, U. S. Army

Fig. 8. Camouflage nets for buildings of moderate size and for parking lots can be built to this design developed by the Corps of Engineers for protection of military objectives. Nets for large buildings require more elaborate suspension.

Wind load is another factor to consider. Tentative conclusions drawn by the Engineer Board from wind-tunnel tests are that the drag on a large net may amount to one half pound per square foot in a 20-mi. wind.

Garnish for nets

Materials most commonly used to garnish camouflage nets are osnaburg—a coarse cotton fabric—burlap and canvas. Osnaburg is preferred as it is lighter in weight than the other two. These materials are cut into long strips which are woven into the nets to give them texture. The effect of depth is created by leaving openings in the net and by letting long ends of the garnish material hang down into the lights and shadows below the nets. Steel wool, treated to check corrosion and drawn out into long strands, is one of the newer materials found to have desirable qualities for

garnish. Experiments now are being made with glass wool and rock wool. Because of the light-reflecting qualities of glass wool and its freedom from corrosion and decay, it appears to have many advantages.

Color is added to garnish materials by painting or dying. Fabrics generally are treated to make them resistant to rot and mildew. Paint is preferred to dye as its colors are more permanent.

Another form of garnishing is produced by dipping the nets into waterproof glue and sprinkling chicken feathers over them to give a surface of the desired continuity. The feathers can be colored by spray treatment if required.

Scarcity of zinc for galvanizing nets has presented a difficult problem to the Army engineers in charge of camouflage work. At the present time they are experimenting with enamels to see what can be done with them in the way of protecting wire nets against corrosion.

Texture and colors

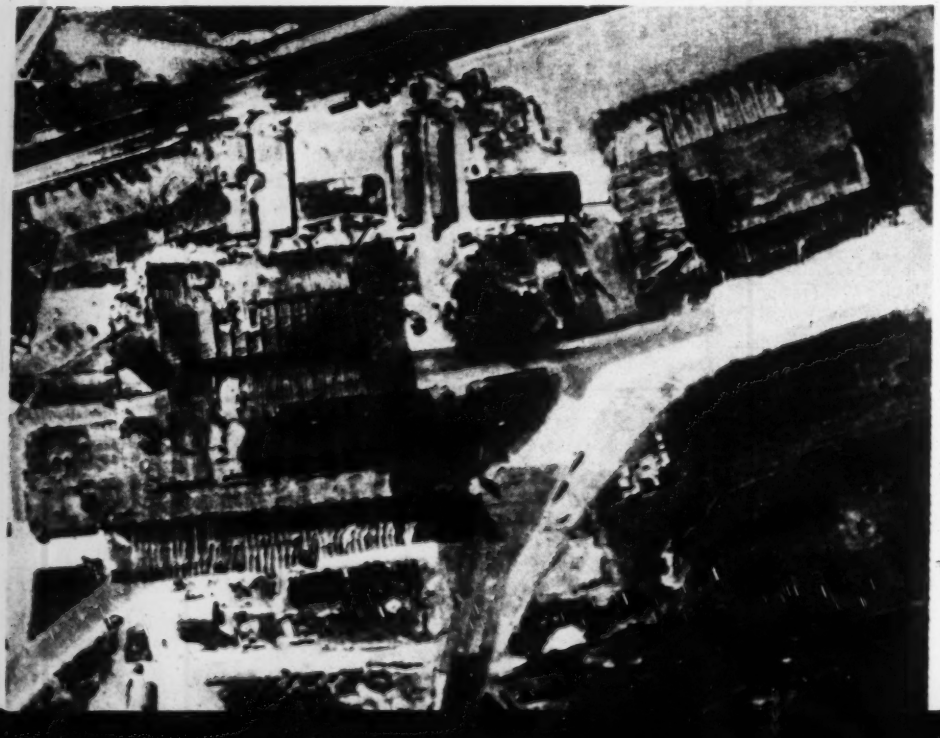
Nowhere is more accurate knowledge of materials called for than in the handling of garnish and colors in protective concealment. Any intelligent person can grasp the basic principles of camouflage in a short time, but much longer training is required to learn how to use colors and texture to get the correct effect from the air. The light-reflective or photographic values of foliage or soil are so different from those of the materials used to garnish camouflage nets as to make knowledge of the light-reflective values of the latter materials essential to effective protection.

Reflected rays in the red or infra-red range are the chief sources of error in getting proper results from artificial coloring, especially where the objects of concealment are subject to photographic observation from the air. Green foliage reflects a considerable amount of red and infra-red, yet the eye does not perceive the visible red because of the presence of the much greater number of reflected green rays. Through glasses that filter out all but the red rays, green foliage looks pink. The so-called infra-red glasses used to detect camouflage do not convert infra-red rays into visible rays; their usefulness arises from the fact that most bodies that reflect a considerable number of infra-red rays also reflect an appreciable amount of visible red. Hence, objects with high infra-red reflectance, even when in shadow, may be revealed as having peculiar color characteristics when viewed through such glasses or may register on an infra-red film.

Sensitiveness to infra-red films or observation with infra-red glasses is not as important in industrial camouflage in this country as it is in purely military camouflage subject to close observation and frequent photography. When specifying colors for industrial work, structures in cities or structures made to resemble other structures need not be painted with coatings having infra-red properties. Structures in rural areas that are not to be disguised to resemble other structures should preferably be coated with materials to match the infra-red properties of the surroundings, but if pigment to give paint these properties is critical, and if enemy photographic observation is not expected to be frequent, the Army engineers do not call for the use of such paint.

Fig. 10. Germany attempted to conceal large buildings at the Hinkel aircraft works in Rostock from British airmen by camouflage nets. This picture, taken after the British mass attack, shows how the nets were revealed by air photographs from low altitudes.

British Official Photograph



Granular surfaces

Much can be done in the way of deception by the application of granular material to exposed flat surfaces such as roofs. Flat surfaces, even when covered with dull paints, still have a much higher reflective value than soil, turf or foliage, even though color values may appear to be very similar. This is especially noticeable from the air when viewed from certain angles, as a view from the east in the late afternoon. At such times, it is the *amount* of light reflected rather than its color that counts, especially when seen from a high altitude. Dispersion of light rays under such conditions can be greatly increased by giving the surface a granular texture. This can be done by spraying the surface with bituminous materials or paints and then sprinkling sawdust, wood chips, asbestos fiber, sand, stone chips or slag over the surface while the coating is still in a sticky condition. The natural color of the granular material can be used to produce the desired color effect, or color can be sprayed on later, as desired. With changing seasons, it may be necessary to change some colors.

Because of the reflective value of flat surfaces, roofs, generally, should be painted darker than walls.

Roofing paper that is surfaced with crushed slate can be used in some locations, especially over skylights where paint put directly on the glass may result in serious cracking.

Dazzle painting

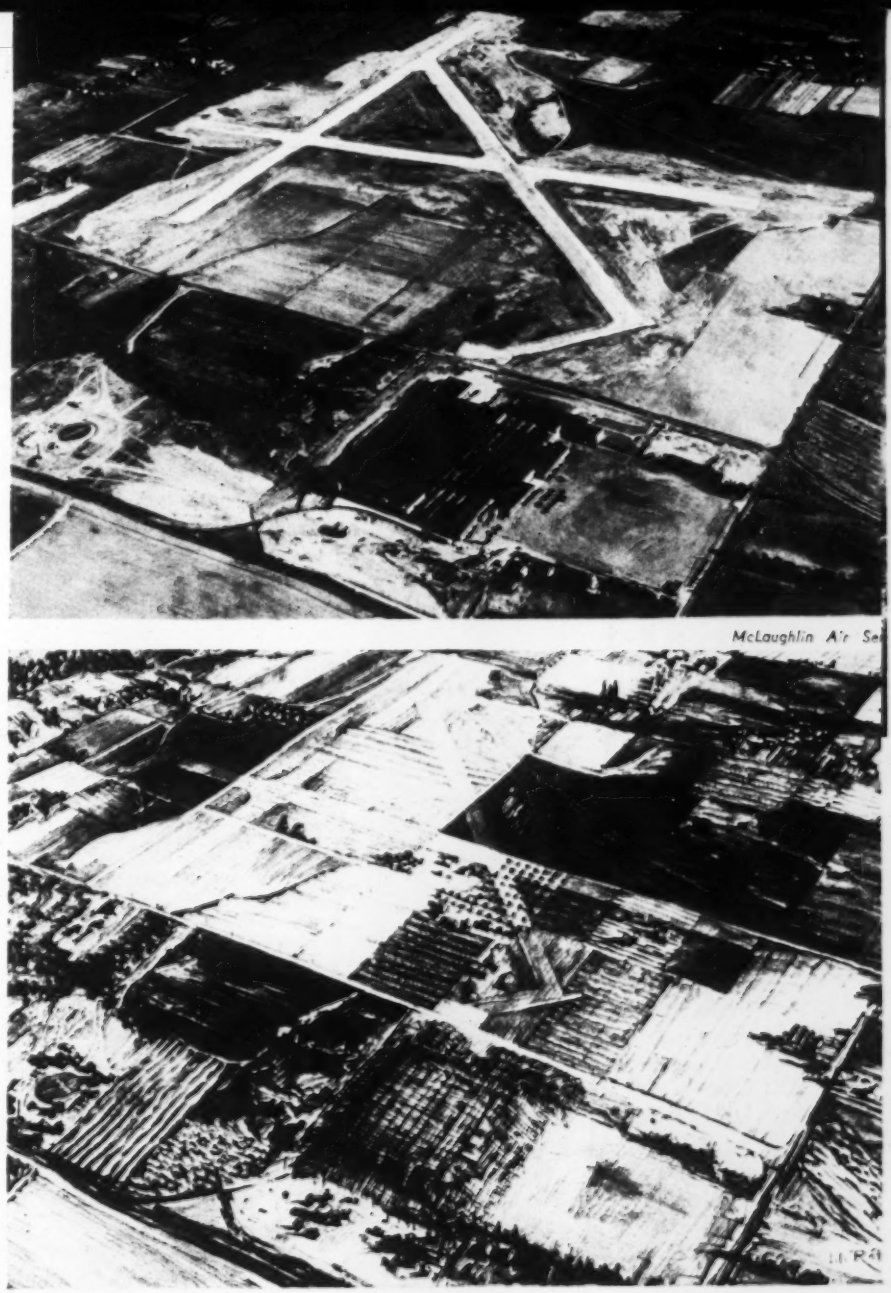
Dazzle painting—mottling a surface with sharply contrasting colors—is not an important factor in industrial camouflage due to the fact

that most enemy observation will be from such high altitudes as to make that type of painting ineffective. On the other hand, daubing light colors over a dark surface—sometimes mistaken for dazzle painting—can be used effectively to lighten an otherwise too dark surface without going to the expense of painting the whole surface a light color. Similarly, the use of counter shadows — painting surfaces normally in shadow lighter than surfaces exposed to full sunlight — is effective only for large areas. Small details do not count in high-altitude observation.

Planting

Planting of trees and shrubs has possibilities for concealing the regularity of form of structures or for breaking up telltale shadows, but it is not as important an element in industrial camouflage as much of the literature on camouflage would indicate. It is easy enough to cut a dummy tree out of sponge rubber, stick it on a skewer and set it up to overshadow a small model of a factory that it is proposed to conceal, but it is quite another matter to reproduce the same arrangement in real life. Few trees are sufficiently tall to overtop a modern factory, and moving enough of them to position to be effective is a slow and costly operation. On the other hand, preservation of existing trees in new construction is highly desirable, for though they may not overtop the larger structures they do screen them in an oblique view and they serve effectively to conceal or break up shadows. Where there are no trees, planting small trees and fast-growing shrubs in areas where the shadows of buildings fall will be found very useful. Knowledge of how to space trees and shrubs to get the maximum amount of shadow concealment under varying light conditions is essential if this rather costly method of concealment is to be fully effective.

Artificial trees can be produced fairly effectively by hanging garnish from the limbs of dead trees or by weaving garnish into a tangle of wires hung from a pole. Where only observation from high altitudes is concerned, proper bulk and light value, and a vague suggestion of shape is all that is needed. A method for doing this, suggested by Konrad F. Wittman of Pratt Institute in his *Industrial Camouflage Manual*, is shown in Fig. 12. Automobiles could be parked under artificial trees of this kind for concealment.



McLaughlin Air Se

Fig. 11. Light-colored runways and fresh grading make airfields and plants near them conspicuous, as shown in the upper view. The sketch indicates the manner in which the same field can be blended into the landscape by deceptive coloring of runways and by putting much of the area back into agricultural use. Dummy farm buildings and trees can serve as dispersion points for planes.

Rail service lines

New railroad tracks to serve war industries that are to be camouflaged should be made as inconspicuous as possible. If the grading is not extensive, this probably can best be done by spreading cinders over the freshly graded areas. In more extensive work, slopes should be flattened and sown with grass or grain. If the track itself shows up too light in air views, it can be sprayed with oil or paint much as is done with roads. Concealment can be increased materially by using light-colored sprays to restore the lines of closed streets across the right-of-way.

Complete concealment of tracks by a system of overhead nets rarely will be justified because of the cost involved, the risk of setting fire to garnish on the nets, and the probability that smoke of locomotives working under the nets would soon de-

stroy any pattern worked out on its surface. If nets are to be used to conceal the plant itself, switching on tracks into and around the buildings may have to be done with diesel locomotives.

Mills and oil refineries

Great steel mills, blast furnaces and oil refineries do not lend themselves to protective concealment, and probably will not be the subject of such treatment, except in rare circumstances that will call for study by Army engineers specializing in such work. Studies have been made of the possibility of protecting oil tank farms either by the use of deceptive coloring or by camouflage nets. Because of the regularity of the pattern provided by the cylindrical tanks in these tank farms, little can be accomplished except by a complete net cover. In new work, the answer seems to be construction of tanks below ground, or tanks buried to a sufficient depth in the ground to provide excavated material that can be used to bury the tops of the tanks in a solid bank.

Power stations and dams

Power stations and dams do not lend themselves well to any form of protective concealment other than that provided by toning down light-colored parts of the structures to make them less conspicuous objects on the landscape. Most power stations large enough to be considered special targets for air attack are located close to large bodies of water, either rivers from which steam stations draw condensing water or reservoirs from which hydro plants draw their supplies. These wide expanses of water are a conspicuous element in any landscape and serve the bombardiers as landmarks in finding their targets. Also, steam stations with their high structures and great stacks that cast telltale shadows are difficult to conceal by confusing color or pattern. On the other hand, power stations, even the large ones of a metropolitan region, are relatively small targets in ground area and so are difficult to hit. Experience in England seems to bear out this conclusion. Unlike airplane plants, they do not cover acres of ground over which a bomb dropped at any point will do major damage or set disastrous fires.

Hydro-electric stations similarly present targets of limited size, though their location may be well marked by a conspicuous dam or large reservoir. Unless the pilot of the attacking plane can orient his path of flight along the axis of the power station, his bombardier's target, generally, is less than 100 ft. wide.

Dams, likewise, provide very narrow targets. Also, most types are difficult to damage seriously by bomb attack. Earth dams of course present wider targets than do masonry structures, but they are much less conspicuous objects on the landscape and can be made ever more inconspicuous by proper planting. Unless an earth dam is in an unstable condition due to a high line of saturation, it would appear that no serious damage could be done to it by anything other than a concentrated bombing attack beyond the limits of probability in this country. Here again, the record of Europe, so far as it has been revealed, has no evidence of damage to dams from air attack. A near miss, landing in the reservoir above a dam might do little injury to the structure itself but might rupture gates in submerged outlets or penstocks of power stations.

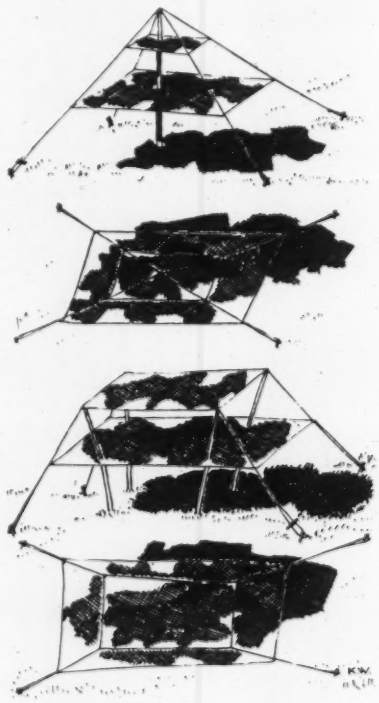


Fig. 12. Methods for producing the effect of trees suggested in the "Industrial Camouflage Manual" of Pratt Institute. Garnished areas on nets cast realistic shadows and give an appearance of height to the artificial trees.

Multiple-arch and buttress-type dams are more susceptible to serious damage by bombs, but here again, the target is so narrow as to make the chance of a damaging hit almost negligible.

Masonry dams can be made less conspicuous objects on the landscape by darkening their concrete surfaces, gate structures and spillway channels. However, if the dam is large and clearly forms a boundary of a large body of water, (which it is impossible to conceal), any attempt to conceal the dam itself by such methods probably would be money wasted.

Proposals have been made to cover large dams with nets such as are used for industrial plants, using appropriate coloring or even dummy structures to make it appear that the dam is some distance away from its actual location. Such operations do not appear to justify the cost in view of the difficulty involved in attempting to hit such a dam with a bomb and the rare possibility that even a direct hit would do serious damage to the structure.

Bridges make poor targets

Bridges, even more than dams, provide narrow targets that are difficult to hit from the air. Bombs missing the structure generally land in water or in soft mud and so do little or no harm, hence near misses are not as serious as in the case of structures on land. So far as is generally known, London's main bridges suffered no serious damage during the concentrated air attacks on that city. Even our great suspension bridges at San Francisco and New York, except for the very rare chance of a direct hit on a cable or tower, would be most difficult to damage seriously from the air.

Water filtration plants

Water filtration plants or sewage disposal plants might be made the objective of air attack intended to affect the morale of a community. However, these plants seem to lend themselves fairly well to concealment simply by toning down the color of structures or by planting to conceal the regular pattern of clarification tanks or other buildings above the ground. Sludge beds could not be hidden except at great cost, which does not appear warranted.

McLaughlin Air Service

Fig. 13. Dams and powerhouses are difficult to conceal but they also are difficult to hit. Dams can be made less conspicuous by toning down light-colored surfaces. Reservoirs form such conspicuous landmarks that attempts at complete concealment of dams forming them does not appear justified in view of the great cost.

Costly mistakes on the part of those considering camouflage of industrial plants or other structures subject to possible air attack can be avoided by a proper approach to the subject. First, plant owners should get in touch with the camouflage section of the nearest district office of the U. S. Engineer Department, either directly or through the local Office of Civilian Defense. If the district engineer's staff believes that some type of camouflage can be undertaken, the preliminary studies then can be put underway, either by the plant's own engineer or architect, acting under the guidance of the camouflage section, or by outside consultants engaged after consultation with the district engineer's staff. Air views, both vertical and obliques, will be necessary in the preliminary studies. Arrangements for them will have to be made through the district engineer's office as the operations of commercial air photographers are strictly limited. Models will be a great help in the study of more elaborate undertakings, but unless they are properly made and studied under conditions that duplicate the effect of aerial observation with reasonable accuracy, they may be worse than useless. When the time comes for putting the studies into concrete form, engineers of the camouflage section should be consulted as to available material. These engineers are kept informed of the results of studies conducted currently by the Engineer Board.

The Engineer Board

All camouflage work of the Army centers in the Engineer Board with headquarters at Fort Belvoir, Va. That board recently has moved into new buildings built in a wooded area where practical application of some of the theories it has developed as to dispersion of buildings, preservation of trees, coloring of concrete roads, and concealment of parked cars in wooded areas, have been put to practical test. The changes introduced in applying these principles added only 4 percent to the cost over what would have been required for a more concentrated layout on cleared land. Laboratories of the board are used to test camouflage materials and for research seeking improved materials or substitutes for materials that are now classed as critical or are difficult to obtain. A large shop is used for the model studies of the board. At the present time the board's camouflage studies are concentrated largely on airport work and on combat problems.

New undertakings

Attention in this article has been centered on when and how to provide protective concealment for existing plants. Little has been said about new plant construction on the assumption that the major problem of today is protection of plants already built. However, all the principles outlined apply with equal force to new construction. Added factors to be considered in new work include preservation of natural characteristics of the site to the greatest possible extent, adaptation of the plant layout to the conformation of the site, and dispersion of operations to minimize the effect of bombing. Size and form of the structures also are factors to be considered. Low structures are easier to conceal than high ones that cast large shadows. Speaking generally, flat-roofed, windowless structures are more easily adaptable to protective concealment than the structures built in the past to house industrial operations.

Available Publications on Industrial Camouflage

"Protective Concealment" issued by the Office of Civilian Defense.

"Industrial Camouflage Manual" by Konrad F. Wittmann for the industrial camouflage program of Pratt Institute, Brooklyn. Published by Reinhold Publishing Corp., New York.

"Civil Defense" by C. W. Glover. A British book published in this country by the Chemical Publishing Co., Brooklyn, containing one chapter of 53 pp. on camouflage.

"Modern Camouflage" by Major R. P. Breckenridge. To be published in September by Farrar & Rinehart, New York.

In addition, the War Department has several pamphlets on camouflage and camouflage materials that are restricted as to distribution.

A well-water city, El Paso is turning to the Rio Grande, in th e background, for a supplemental supply.

El Paso Expands Utilities for Army Use

***Contents in Brief**—El Paso is high on the list of cities that have had to expand their services because of the war. Its population increase of 40 percent is mostly military, which has taxed the water and sewage facilities, although it has not created the usual traffic and housing problems. More water, to supplement the existing well supply, is to come from the Rio Grande, and an elaborate treatment plant is under construction. Plans for an enlarged sewage treatment plant and additional sewers are complete, but construction is held up because of the inadequacy of an A-2 priority rating. A similar rating is slowing work on the water treatment plant. Meantime, both the water and sewage problems are becoming more serious.*

IT TOOK A WAR, but El Paso has finally been forced to turn to the Rio Grande to supplement its well water supply. The same war has made pressure lines out of many of its sewers and so overloaded its sewage treatment plant that "treatment" is no longer an accurate description of what goes on there. As with water supply, measures are being taken to improve sewage disposal but, as also with water supply, progress is being slowed by priority trouble. Behind this obviously serious situation is the fact that the war that has caused it has brought thousands of troops to the city's existing and newly built military establishments. Because the surrounding desert precludes the development of independent water supplies and because the largest of the military colonies is a permanent post that has always depended upon the city for sewage disposal, it is the city's facilities that must be expanded to meet the needs that the war has created.

El Paso has always been an army town so that its outward appearance has not been fundamentally changed by the impact of war. There have always been soldiers on the streets. Now there are just more of them. How many more cannot be stated with statistical accuracy, partly because the number fluctuates. But there must be upwards of 40,000, and that means a 40 percent increase in the city's population, which was around 100,000 in 1939.

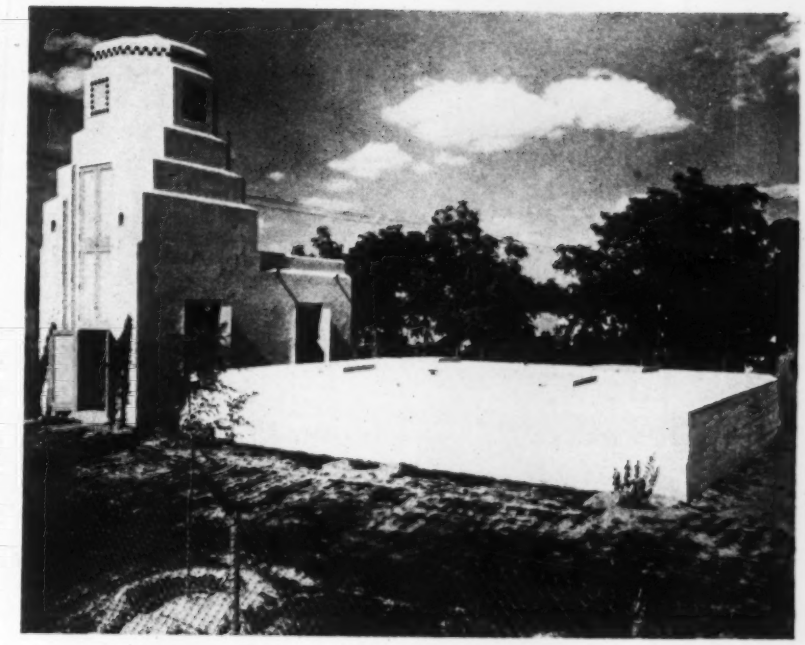
Unlike some other war-dominated cities, El Paso has had a comparatively small increase (about 10,000) in its civilian population, and thus has largely escaped the usual traffic and housing problems. Fortunately, it was prepared to meet the problems that it could not escape, those of water supply and sewage disposal.

Good management pays

El Paso has been noted for the efficiency of its water and sewerage department. Businesslike and under the direction of a non-political water board, it has paid its way without bonds or tax money for a good many years. Solely as a result of charging rates that produce sufficient revenue to meet the costs of maintenance, operation, depreciation, bond service and expansion, the department was able to lay cash on the line for $725,000 of capital expenditures when the war made it necessary. The money had been accumulated in a "plant and equipment depreciation" account against just such an emergency. And it has been accumulated without skimping on necessary expenses, for in this year's budget there is $299,748 allowed for water system operation and maintenance, and $141,877 for interest and sinking fund requirements. The sewage facilities, for operation, maintenance and debt charges, take $66,926 more. If further evidence is needed as to the good condition of the water and sewerage department it is contained in the claim—almost unprecedented among municipal engineers—made by Ashley G. Classen, its superintendent, that he has all the equipment, replacement parts and personnel that he could possibly desire. Finally, it is significant that in this year's water and sewerage department budget $153,322 is earmarked for the "plant and equipment depreciation" account. Even in the presence of one emergency El Paso is getting ready for the next one, realistically facing the fact that it is sure to come.

With such a background of good management it is not surprising that the city's present public works expansion really was begun in 1940, when the implications of the military situation first became apparent. As a re-

sult of this forehandedness, plans are now complete and money is available for a $485,000 sewage treatment plant and some vital new lines, while a $755,000 water treatment plant is actively under construction. The federal government is participating in the financing of the water plant in an amount of $385,000 and is contributing $285,000 for the sewage treatment plant, but the rest of the money comes from the city's water and sewerage department funds. Both these facilities are badly needed, but the A-2 priority rating that they have been assigned is an effective brake on progress, so effective indeed that it has not been thought worth the gamble to start the sewage plant with it. An A-1-c rating is being sought, but even this will not produce some of the water plant valves in less than 36 weeks.



El Paso's present water supply comes from wells. This typical installation, built in 1936, is composed of a pumping house over a single well, 735 ft. deep, and a settling basin providing one-hour detention. It cost $34,500.

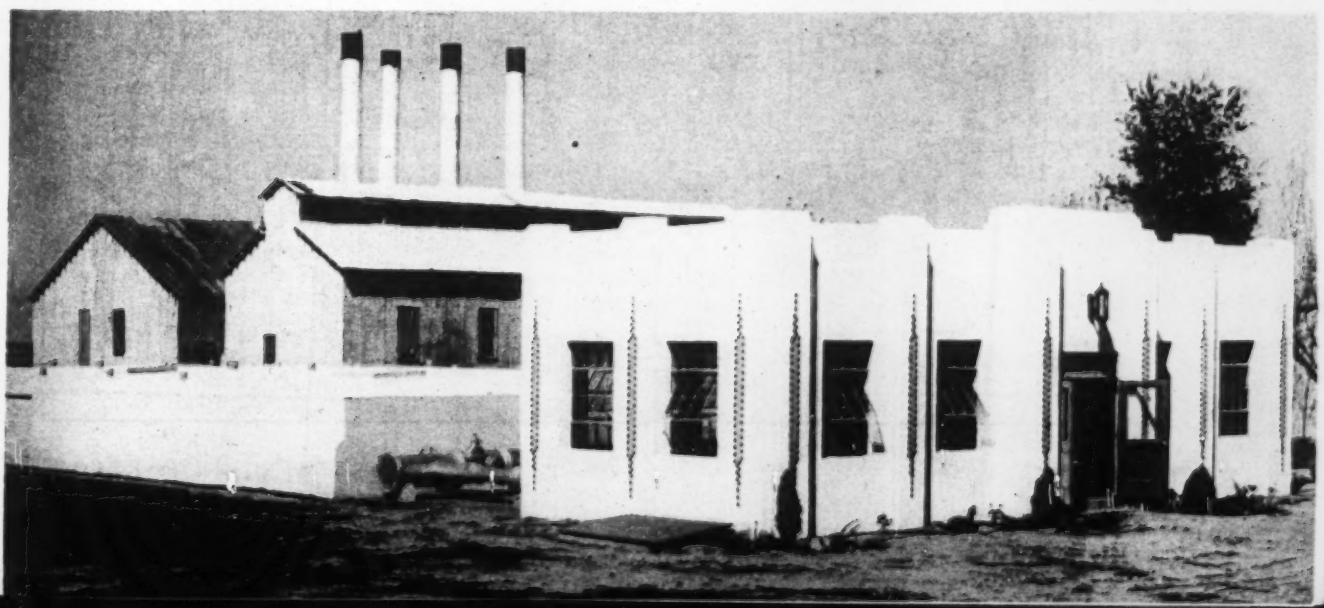
To the Rio Grande for water

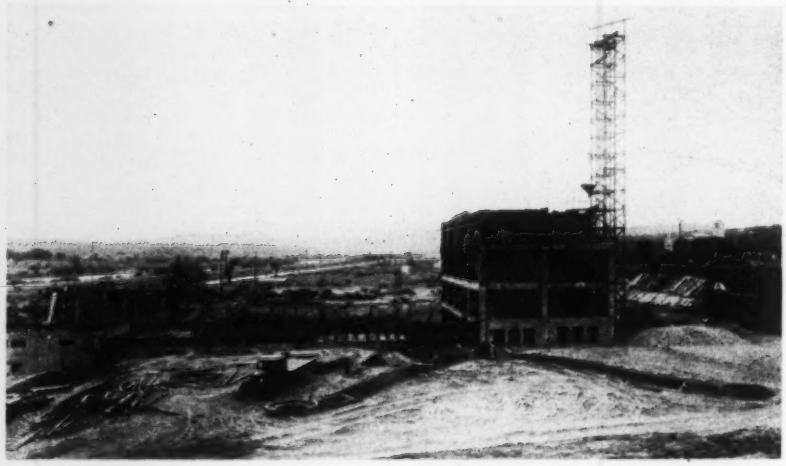
The decision to utilize Rio Grande water for a domestic supply at El Paso is of more significance than at first meets the eye. From its early beginnings as a cow town and cavalry post of the army, perhaps because of such a beginning, the city has always obtained its water supply from wells. Because this water is satisfactory, requires little treatment, and has until recent years been available in adequate amount, there was no incentive to develop a Rio Grande supply, which would require expensive treatment. So, despite the fact that the Rio Grande water flows right through the city in an irrigation canal, it was only in long-range plans that it was even considered for domestic use. The war emergency, however, has made it necessary to dust off these long range plans and put them into effect.

El Paso's present water supply comes from 16 wells having a combined theoretical capacity of 20 mgd.: an actual capacity of 15 to 17 mgd., considering that one or more wells must frequently be out of service for repairs; and a safe capacity of 13 mgd., based on recharge ability. Seven pumping stations are operated, five of them serving single wells while one serves a group of eight wells and another a group of three wells. At each pumping station the water is discharged into a small covered reservoir where a few hours detention provides all of the settlement required for removing fine sand. Additional treatment consists of application of chlorine and ammonia at the time the water is pumped from these reservoirs direct into the system. Pressure and reserve supply are assured by six covered storage reservoirs with an aggregate capacity of 70 mg., which ride on the system at several elevations throughout the city. Automatic chlorination is provided at the discharge of each of these reservoirs.

This was the water system that was supplying El Paso when the war army

Biggest well-pumping installation is this one serving eight wells and providing 9 mgd. Electrically operated, it replaced the old steam and diesel plant in the background, once the largest of its kind in the world and recently sold for scrap.



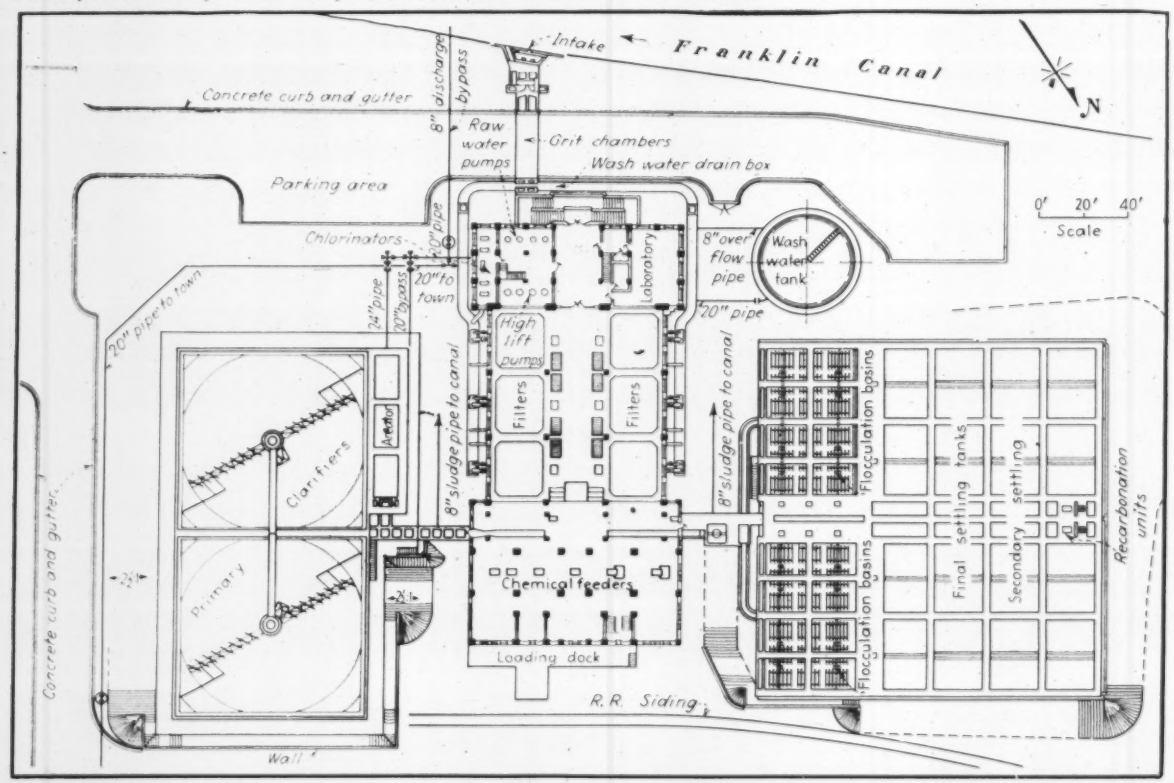


How El Paso's treatment plant looks today. The Rio Grande is at far left, while the irrigation canal in which the intake is located is nearer the plant. Tall structure at the right is the chemical building, while the circular bases for the primary clarifiers are in the foreground.

began moving in in 1940, jumping the average pumpage from 9 to 12 mgd. By 1941 the peak demand was up to 16 mgd., and expanded army facilities now under construction will raise this to 18 mgd. before the end of 1942. Since pumping beyond 13 mgd. exceeds recharge ability, invites salt water intrusion and causes a pronounced increase in hardness, El Paso is rapidly destroying its water supply under present conditions.

Decision as to where a new supply was to come from was an easy one. Because development of more wells would merely decrease groundwater at an accelerated rate, the only solution was to turn to the Rio Grande, which offered a dependable year-round supply because of the U. S. Bureau of Reclamation storage dams upstream at Elephant Butte and Caballo. The city is entitled to 23 sec.-ft., from the river, equivalent to 14 mgd. or 7,000 acre-ft. per year, providing it buys and retires from cultivation an amount of land (2,000 acres) in the irrigation district that has a water demand equivalent to this amount. The land may be bought in any part of El Paso County, Texas or along the river in New Mexico. The Texas land is expensive, about $500 an acre. New Mexico farm land is less expensive, but the city is required to guarantee its perpetual freedom from noxious weeds and erosion, a stipulation that might prove very costly. Decision on purchase of the water right in New Mexico is still pending, but in the meantime the treatment plant is under construction on a schedule that contemplates completion in March, 1943, dependent upon priorities. With the plant in service enough treated river water will be turned into the system to permit the wells to be pumped at a rate that will assure their annual recharge and keep them free of salt water.

General layout of El Paso's new treatment plant for Rio Grande water. Practically anything that can be done to make water potable and pure will be possible with the facilities that it contains.



The new treatment plant is located in the southwest corner of the city adjacent to the Franklin irrigation canal, which at this point is parallel to and only about 100 ft. from the Rio Grande. Water will be diverted from the canal directly into the plant intake. Of 10-mg. capacity, the plant will be equipped to do everything to water that the science of water treatment has so far developed. With a turbidity of 1,500 ppm., a mineral content that varies from 750 to 1,600 ppm., and the possibility of a variety of water-borne disease bacteria, raw Rio Grande water is far from an ideal product. Just to be sure, the new plant is designed to turn out potable and pure water no matter what the Rio Grande brings to it.

As shown in the accompanying drawing, water will enter the plant through self-cleaning trash screens and flow to the low service pumps where iron sulphate and chlorine will be added. Twin primary clarifiers of the square tank type will then provide for three hours of settling before the water is turned into a flume leading to the chemical building; an aerator of the diffused air type is located in the bottom of the flume where it can be turned off or on without changing the direction of the flow.

The chemical building contains equipment for applying lime, soda ash, activated carbon, iron sulphate, chlorine and ammonia. It is served by a railroad siding at first-floor level, which is connected to the basement and all upper floors by an elevator and pneumatic conveyors. Facilities for flocculation, secondary clarifying, recarbonation and automatic pH control are provided, after which the water goes to the filters and thence to a clear well. Provision is made for recarbonation by underwater gas burners and for probable subsequent restabilization by passing the water through a bed of limestone or marble chips. From the clear well high-service pumps will lift the water into the distribution system and at the same time charge it with chlorine and ammonia as needed.

The treatment plant is placed on a fill so that the lowest floor is above static groundwater level. The operating floors are 25 ft. higher and are on the same level in the chemical building, filter plant and pumping station. Every line of piping in the plant is accessible, and there is no stooping for low ceilings. Pipe galleries run to the primary and secondary clarifiers so that sludge and water lines are open to inspection at all times. Hedman, Ferguson and Carollo, Phoenix, Ariz., are consulting engineers for the water treatment plant and for the proposed enlargement of sewage facilities as well.

The sewage disposal problem

Insofar as urgency is concerned there is little to choose between water supply and sewage disposal. Raw sewage could in an emergency, of course, be bypassed directly into the river. However, such an expedient can be contemplated only in event of dire necessity, and meantime the sewage to be treated is increasing rapidly. One thing that must be done immediately is to install a duplicate outfall line to the sewage plant because the existing line may overflow almost any day. Recognizing this menace, the WPB granted an A-1-e priority for this line, as compared to an A-2 for the sewage facilities as a whole, but so far not even the A-1-e has been able to produce the wire reinforcement required for the 7,200 ft. of 25-in. concrete pipe that is involved; for lack of $3,000 worth of wire mesh, a vital $65,000 sewer line is held up, a prime example of the serious consequences that attend critical material shortages.

The proposed new sewage treatment facilities comprise additions to the present plant to increase its capacity from 8 to 15 mgd. It is a chemical treatment plant using chlorinated copperas and is unusual in that it makes its own copperas solution from iron and steel turnings and sulphuric acid. This procedure has been found cheaper than to purchase commercial ferric chloride, and will be retained in the new plant.

In general, the contemplated improvements include a new pumping set-up at the sewage treatment plant to replace a very old one at another location; a new chemical plant to generate copperas; doubling the size of the settling basins; and adding primary sludge digestion and a floating-dome gas collector, with sludge gas engines to generate plant power. The existing aeration set-up will not be changed.

As this article goes to press El Paso's sewage disposal improvements still consist only of drawings and specifications. Its water treatment plant is only 15 percent complete, but going ahead. Mr. Classen and the Army engineers are in almost daily communication with the War Production Board seeking a priority rating that will produce the needed equipment and materials. And the War Department is constantly moving more troops into town. There is little question but what El Paso knows that we are at war.

Cities in Detroit Area Join in Regional Planning

Ten cities are represented on the regional planning committee set up to assist the Detroit defense area in meeting the impact of overnight expansion of wartime industry that may bring a migration of workers comparable to that of the 1920's.

The committee was appointed by the mayor of Detroit as a fact-finding, advisory and coordinating agency, according to the American Society of Planning Officials. The state planning commission and the city planning commissions of Detroit and Dearborn are represented on the committee, along with the Engineering Society of Detroit, Citizens Housing and Planning Council, Huron-Clinton Parkway Authority, Federal Housing Authority, Wayne County Bureau of Taxation, and the cities of Pleasant Ridge, Ferndale, Highland Park, Grosse Pointe, Dearborn, Trenton, Ypsilanti, Ann Arbor and Romulus.

A technical staff was formed of personnel loaned from the various agencies holding membership on the committee, and studies of housing, transportation and utility needs in the area now are underway with first reports on immediate needs completed. Basic data are secured from the agencies directly concerned, and the information is clarified and coordinated for presentation to public officials of the cities and of the state and the federal government.

Fig. 1. Fill was brought to the dam at 20 m.p.h. in 13-cu.yd. wagons.

Rolled-Fill Methods at Sepulveda Dam

J. G. Morgan
Area Engineer, Corps of Engineers
Los Angeles, Calif.

Contents in Brief—*In building this dam for Los Angeles flood control, several interesting procedures were used to increase construction speed and to give a well-compacted embankment. Long hauls were made with 13-yd. rubber-tired wagons traveling 20 m.p.h. Two 8-hr. shifts were worked. Water-filled holes were not pumped but were emptied by crowding the water out with earthfill. Fastest progress was made with borrow material below optimum moisture content. Maximum density was obtained when 6-in. lifts were not exceeded even by a small amount.*

COMPLETION OF SEPULVEDA DAM on the Los Angeles River five months ahead of schedule provides important additional security from floods for one of our most vital industrial communities. In combination with the Hansen and Lopez flood control basins, Sepulveda will be able to regulate flow in the Los Angeles River, under any anticipated conditions, to the 7,100 cfs. that its new channel is designed to carry safely. Total capacity of Sepulveda reservoir to the top of the spillway gates is 16,700 acre ft. The basin will regulate the reservoir design flood, having a peak flow of 69,000 cfs., to an outlet flow of 7,100 cfs.

Sepulveda Dam is a compacted earthfill, 15,443 ft. long, with a maximum height of 57 ft. above the outlet gate sill, and involved the placing of 2,363,201 cu.yd. of rolled fill. Although it contains a concrete spillway and gates that involved interesting design and construction considerations, principal interest centers in the placing of the earthfill, since the methods used here may have application on other rush war jobs at the present time.

It was required to excavate about 4½ million cubic yards of material for the construction of the dam. Carrying scrapers of the most modern design were used for stripping and short haul excavation, but the greater part of the excavated material for the embankment was loaded on 13-yd. rubber-tired wagons by crawler-drawn elevating graders. These wagons were used on the longer hauls and were capable of maintaining a speed of about 20 m.p.h. with a full load and 26 m.p.h. empty.

During the peak of construction the following equipment was used at the dam site and the quarry: seven draglines, one shovel, three elevating graders, twelve 13-yd. wagons, five road patrol graders, thirty-two tractors, two 2-drum and two 3-drum sheepsfoot tampers, two scarifiers, one heavy-duty rooter, four sprinkler trucks and ten carrying scrapers. Peak monthly progress involved the excavation of 414,000 cu.yd. of material and the placing of 263,000 cu.yd. in the dam. Two 8-hr. shifts were employed, thus allowing time for the maintenance and repair of equipment.

Type of material encountered

The Los Angeles River at the damsite does not possess the usual characteristics of the headwaters of other Southern California streams. At this point the river flows through the ten-mile wide San Fernando Valley, and the gradient of the stream through the valley is comparatively flat, being controlled by the elevation of the outlet from the valley. At the reservoir the drainage to the river is comparatively poor, and in places the river almost assumes the characteristics of a meandering stream. This characteristic of the river is reflected in the geological aspects and the soils of the valley floor. The soil in general is of a very fine grade, ranging from 1 to 40 percent in clay content, and (except in rare cases) 100 percent passed the 2.0 mm. screen. Much of the material adjacent to the present riverbed is what is commonly called "gumbo" or "sticky gumbo"; when wet it is sticky and difficult to travel over and when dry it resembles sun-baked brick. When the material is in a dry condition it is extremely difficult to add additional water, since the water does not penetrate to the center of the brick for some time.

The groundwater table is generally near the surface in the reservoir area, ranging from 5 to 10 ft. beneath the ground, and in a few places is above the ordinary level of the river. This condition required the adoption of several extraordinary measures in excavating the new inlet channel.

For purposes of construction the dam was divided into two parts. The first part, that half north of the spillway, was almost completed before the work was started on the second half lying west of the spillway. The first half of the dam presented little or no difficulty. The foundations were all dry and above the groundwater table. The material used in the fill came from the borrowpit several hundred feet from the upstream toe and was generally of a silty, friable nature, averaging about 18 percent clay. This borrowpit, too, was above groundwater table, and all material was deposited on the fill at a moisture content below optimum. This last fact was found to be of considerable importance to the speedy conduction of the fill operations, inasmuch as it was much more convenient, both with respect to equipment used and time consumed, to add water than it was to dry out material after it was placed on the fill. This fact influenced the strategy of attacking the west half of the dam.

Handling wet borrow material

For the west half, the material came mostly from the excavation for the inlet channel. This material was of a much more clayey consistency and much wetter than that used on the north half of the dam. However, since the inlet channel more or less parallels the axis of the west half, the economy of using this material, if at all possible, was evident. It was foreseen that it would be very difficult to dry out this material after it was placed on the fill and some method of drying the material before placing was needed.

A method of ploughing the borrow area several days before excavating with the elevating grader had been tried already on the more clayey sections of the north borrowpit; but it was found that only by continually working the soil could it be prevented from drying out into bricks, which were just about as inconvenient to handle as the over-wet clay. Therefore, several months before start of operations in the channel, drainage

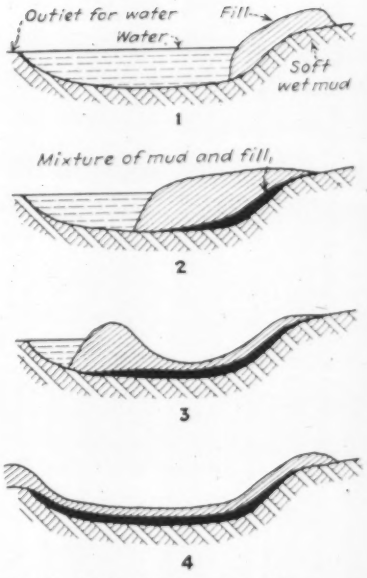


Fig. 2. How filling operations were used to crowd groundwater out of the excavated river channel at points where it crossed the dam.

ditches with nearly vertical sides were dug along the lines of the toes of the channel slopes; these were dug to grade or slightly below. This left a block of soil at the center of the channel free to drain into the ditches. These ditches were kept empty of water by extension ditches and pumps. Cross-overs to the center block were underlain with sections of culvert pipe. After several months it was possible to excavate this center block with an elevating grader, working long stretches at a time. However, some of the material near grade had to be excavated with a dragline because it was still too wet. The material from the drainage ditches and all other wet material was cast up on the bank and allowed to drain for several months. Some of the better material was used in the dam, some was used on the dikes along the inlet channel and the rest was wasted.

Crowding water from holes

Where the west half of the dam and the inlet channel levee crossed the old riverbed, considerable difficulty was expected in placing the first few lifts of rolled fill. The river channel was first cleaned out with a dragline, the banks and bed were stripped of all vegetation as well as a black, gas-filled mud, and the slopes were dressed down evenly. After all this material had been removed the resulting hole was well below groundwater table and immediately filled with water. A very satisfactory method of dealing with this situation, without going to the expense of building cofferdams and extensive pumping systems, was developed.

The accompanying sketches illustrate the methods of placing the first lift. The fill material was first dumped on the banks and then was pushed forward into the water by bulldozers. At first the fill was kept above the level of the water, but after it had been pushed out several lengths the dozer began cutting back the ex-

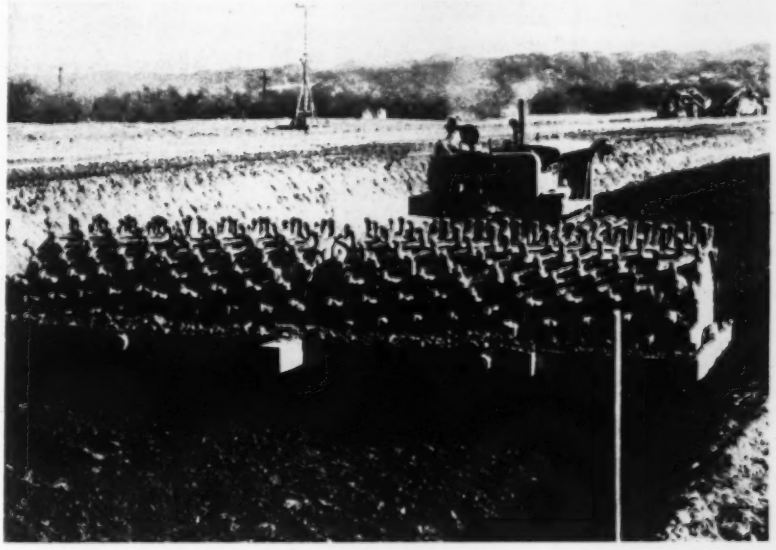


Fig. 3. Compacting earthfill with sheepsfoot rollers gave best results if layer was less rather than more than 6 in. With thin layers the required 90 percent of maximum density could be obtained even though optimum moisture was exceeded by 5 to 6 percent.

cess fill, pushing it forward to dam off the water. The dozer cut back the excess fill until the "crust" showed signs of weakening. The tractor treads were the only instruments of compaction on the first lift, and the dozer made many extra trips to insure compaction. The second and third lifts were placed in 6 in. thicknesses, and were compacted by a small sheepsfoot roller, where it could be held up, or otherwise by the tractor treads. After that it was possible to resume normal operations using the 2,200-lb. per ft. rollers.

Telescopic-pipe settlement indicators of the type developed by the Bureau of Reclamation were installed at nine locations in the fill. They indicate separately the settlement of points spaced about 5 ft. apart from the foundation to the top of fill, and consequently they also indicate the amount of vertical consolidation between these points. One of these installations was located on the intersection of the center line of the dam and old riverbed. The percentage of consolidation (4½) of the first 5 ft. of fill at this point was no greater than that at another point, 1,000 ft. distant, where normal fill operations prevailed. The details of this process were worked out as the work progressed. It is believed that this process could be used to great advantage in other similar situations where heretofore the foundations have been pumped dry and cleaned out completely. The foundation at this point had settled approximately 0.8 ft. up to the time of completion, and the settlement curve is now flattening off.

The contractor maintained a complete system of roads between the borrowpit area and the fill. None of these was a permanent all-year road, since during the rainy season it was impossible to carry on fill operations regardless of the road conditions. And, because no surfacing was used, the roads could be remade or abandoned without loss. The clay of the country-side provides a very smooth surface when packed down by equipment tires and helped along by occasional wetting and smoothing. Dust was a nuisance during the dry, summer months, but it was usually kept to a minimum by frequent application of water. Water for both fill and roads was applied by trucks carrying 2,000-gal. gravity-feed tanks.

The following tabulation shows the averages of moisture in place, clay content, optimum moisture and optimum density for a depth of 10 ft. in each of the two main borrowpits:

Location	*Percent moisture*	*Percent clay*	*Percent optimum moisture*	*Optimum dry density (lb. per cu. ft.)*
Main borrow pit	17.7	18.5	12.6	118.6
Channel borrow pit..	24.8	22.4	13.2	115.5

The range of optimum values for all the material is as follows:

	Percent optimum moisture	*Optimum dry density (lb. per cu. ft.)*
Maximum ..	9.0	128.0
Minimum ..	16.0	107.0

It should be noted that the method of obtaining these optimum values may be somewhat different from that used in most laboratories. In this case the material was pounded into the cylinder by raising the ram above the head and bringing it down upon the material in the Proctor cylinder with all the force available to the operators. The material was placed in the Proctor cylinder in the usual manner, that is, in three layers with 25 blows per layer. This method seems to eliminate the personal equation to a great extent without resorting to complicated apparatus that slows up production. The method also gives a higher optimum density and a lower optimum moisture than when the ram is dropped 18 in. into the cylinder. However, in the embankment it is necessary to obtain only a certain percentage of optimum density, which previous laboratory investigation has shown will give satisfactory consolidation, shear and permeability characteristics. At Sepulveda Dam it was found that 90 percent of this optimum density would give satisfactory results in the embankment.

Density tests were made of the fill as the work progressed (about ten per day), and optimum curves were made for each test, using the material from the density test hole. The density in place averaged slightly above 91 percent of optimum.

One interesting fact observed on this dam was the effect that the thickness of the layer before rolling had upon the density obtained. It was found that if the thickness of the lift were only a few percent more than the 6 in. allowed, the density obtained was reduced considerably. This effect was noticed mostly on the material with high clay content. Therefore, considerable effort was made to insure a 6-in. maximum lift. This was done by careful inspection of the dumping of the trucks and by proportioning the number of loads to the area covered.

By decreasing the thickness of the lift it was often found possible to obtain 90 percent of optimum density, even though the material might contain 5 or 6 percent more than the optimum moisture. However, the rollers could not pull through material wetter than this.

All States Adopt Reciprocity and Minimum Sizes and Weight Rules

Commerce Secretary Jesse Jones has announced that governors of all 48 states have agreed to reciprocal licensing arrangements for motor transportation "for the duration" and to uniform minimum standards of motor vehicle sizes and weights. The standards in most states were put into effect by governors' proclamations.

Representing more liberal regulations in about one-third of the states, the new minimum motor vehicle size and weight standards follow:

Permissible height, 12½ ft.; width, 96 in.; length for a single vehicle, 35 ft.; length for a combination vehicle, 45 ft.; weight per inch width of tire, 600 lbs.; weight on one axle, 18,000 lbs.; weight on two axles, 30,000 lbs.; weight on three axles, 40,000 lbs.

The new size and weight regulations follow closely the recommendations of Commissioner Thos. H. MacDonald of the Public Roads Administration, made before the recent Federal-State Conference on War Restrictions at Washington, D. C. In presenting the specifications as a "floor" below which state and local restrictions should not descend, Mr. MacDonald said: "When our national security depends on the full utilization of all our transportation facilities, interference with the reasonable movement of motor carriers should no longer be tolerated."

Army Bio-Filter Sewage Plant Provides Unusual Flexibility

***Contents in Brief**—To provide a high degree of treatment for sewage from an army camp in which the population is expected to vary from 3,500 to 35,000, the bio-filtration process was selected, and the plant was designed with duplicate units. By means of interconnections, any or all of the units may be operated to produce a fixed degree of treatment regardless of flow variations caused by population changes.*

DESIGN of sewage disposal works at an army camp where the troop population is expected to vary from 3,500 to 35,000 over a period of days, called for a plant of unusual flexibility to handle great variations in flow. This was provided by installing the bio-filtration type of treatment, using duplicate sedimentation units, filters and final clarifiers, any or all of which may be operated, depending on flow conditions.

Aside from functional design, the installation of the plant featured the use of asbestos-cement pipe and conduits in order to conserve critical materials, and construction was expedited to meet a 60-day schedule by the use of high-early-strength cement throughout.

As shown in Fig. 1, the principal plant units include the following:

Two primary clarifiers, each 70 ft. in dia. and 13 ft. deep
Two bio-filters, each 125 ft. in dia. and 3 ft. deep
Two final clarifiers, each 70 ft. in dia. and 13 ft. deep
Three digester tanks, each 40 ft. in dia. and 20 ft. deep
Twenty sand-drying beds, each 25x60 ft. in area

Treatment units are so interconnected that the plant may be operated in almost any manner to produce a varying degree of treatment or to produce a fixed degree of treatment regardless of flow variations. For example, it is possible to use the clarifiers in parallel or in series to provide sedimentation only, and bypass all other units: or, two clarifiers can be used with subsequent treatment in one filter; or one clarifier can be used in conjunction with the two filters.

It is to be noted that not only does the piping permit various combina-

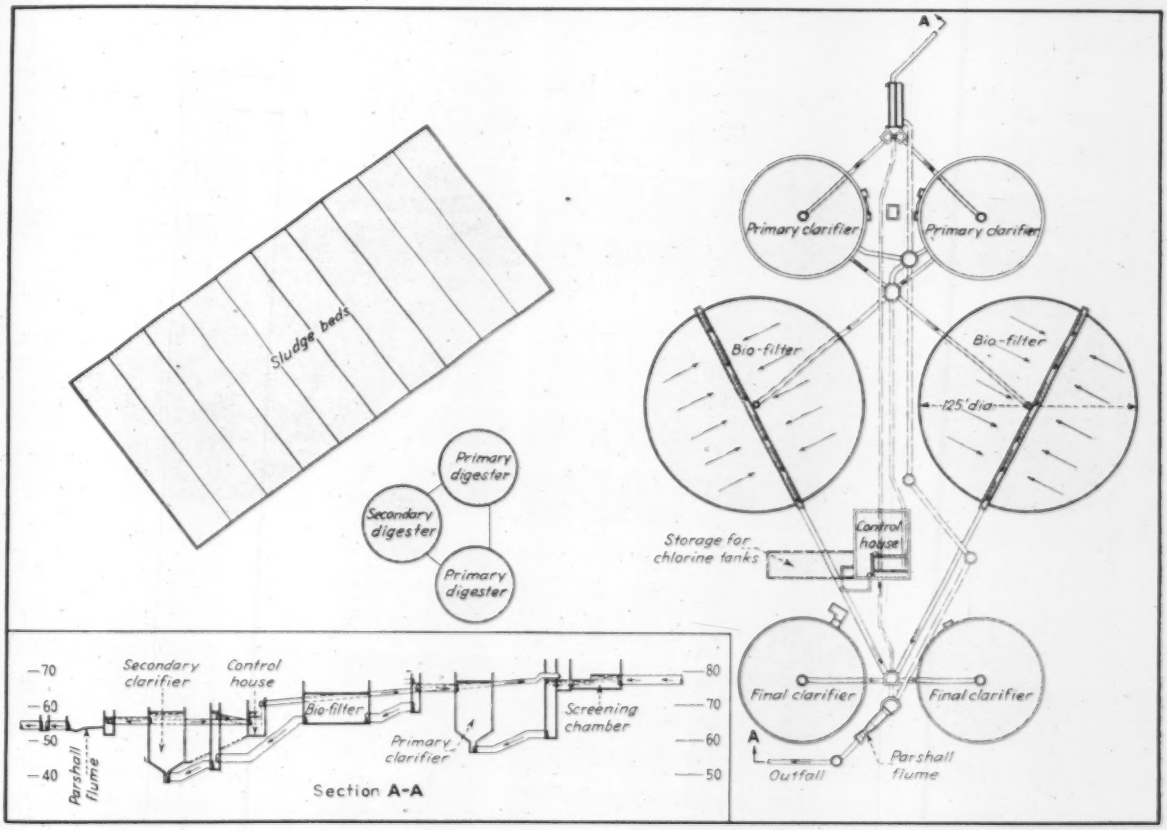


Fig. 1. General layout and flow diagram of a bio-filtration-type sewage treatment plant with duplicate units. This plant was designed for an army camp in which the sewage flow varied over a wide range.

tions and bypassing of units, but these connections make it possible also to drain completely each unit should it be necessary to take it out of service. This latter provision will contribute greatly to the convenience of both operation and maintenance. To prevent bypassing sewage except under direction of a qualified, licensed operator, locking devices have been provided for all valves and sluice gates leading to the bypass lines.

Of special interest is the use of the outfall sewer as a chlorination chamber in lieu of constructing a contract chamber for this purpose. About 3,000 ft. of the 5,000-ft. outfall (of 30-in. pipe) has a flat grade of 1 ft. per 1,000 ft. of length. It was determined that by introducing chlorine solution at the beginning of the outfall, there would be ample admixture and contact in the 30-minute time required for the sewage flow to reach the end of the outfall sewer. The outfall discharges into tidal water.

Plant capacity determination

Plant capacity was based on an estimated average per capita flow of 85 gal. per day, with a peak of 210 gpd. This figure included an allowance for infiltration, estimated to be 200 gal. per inch of diameter per mile in 24 hr.

Sewage is entirely domestic, and the assumed characteristics were as follows:

Suspended solids	0.27 lb. per capita per day
Bio-chemical oxygen demand	0.20 lb. per capita per day
Fats and grease	150 ppm.

In proportioning the units, the daily flow in gallons was taken as follows:

Minimum	600,000 (17 gal. per capita)
Average	3,000,000 (85 gal. per capita)
Maximum	7,350,000 (210 gal. per capita)

To allow for peak flow conditions, a factor of safety of 1.2 was applied to the bio-chemical oxygen demand calculations. It was assumed also that a reduction of 40 percent in B.O.D. would occur in the primary clarification process.

Bio-filters were proportioned at the rate of an acre-foot for each 3,000 lb. of B.O.D., the B.O.D. production in turn being based on 0.20x1.2=0.24 lb. per capita per day, or 0.24x35,000 =8,400 lb. In view of the fact that there would be a 40 percent reduction in B.O.D. after the sewage passing through the clarifiers, the net B.O.D. load was placed at 5,040 lb. per day.

Using a filter with a stone depth of 3 ft. (considered a desirable standard for the high rate filtration process), the resulting tank diameter was calculated to be 125 ft.

Fig. 2. Temporary housing for chlorination facilities. Sewage was passed through the plant prior to the completion of all the treatment units.

Digester capacity was based on an allowance of 2.67 cu.ft. of storage per capita, or a total storage (heated and unheated space) of 93,000 cu.ft. For sludge drying, sand beds were provided, the area of which allows 0.86 sq.ft. per capita; ample space remains for the enlargement of the drying bed area should this prove to be necessary.

In proportioning the clarifiers, a recirculation ratio of 1 to 1 was assumed. That is to say, the flow to be handled would be double the average flow or 6 mgd. (3 mgd. per clarifier). This same rate of flow applies also to the secondary clarifier. Assuming an overflow rate of 800 gal. per sq.ft. per 24 hours, and a detention period of three hours, a tank whose diameter is 70 ft. and whose depth is 13 ft. was determined to be the proper size.

The plant is expected to produce regularly an effluent with only 30 ppm. of B.O.D. and 35 ppm. of suspended solids. It is expected also that the effluent will have a dissolved oxygen saturation of about 50 percent.

Operating procedure

All the clarifiers are to be equipped with mechanical sludge and scum-collecting mechanisms. Both primary digesters will have fixed covers and motor-driven stirring mechanisms, while the single secondary digester will include a gas holder with a float-

Fig. 3. Asbestos-cement pipe was used throughout the plant to conserve critical materials. Shown here are valves attached to pipe sections.

ing cover to provide about 1,500 cu.ft. of gas storage.

Sludge and scum from two primary clarifiers will be pumped to the primary digester: sludge and scum from the secondary clarifiers, however, will be returned to the incoming flow to the plant. Provision also has been made for the return of both the digester supernatant and the sludge bed filtrate to the plant influent line, where it joins the incoming sewage.

Sludge bed filtrate will be retained in a detention chamber before it is delivered to the influent. This chamber will be pumped out periodically, thus making it possible to measure as well as to sample the filtrate. During wet weather, when the sludge bed will become rain-soaked, the drainage or filtrate will be permitted to overflow the detention chamber and pass directly to the outfall sewer.

In normal operation the effluent from the bio-filters will be returned to the first diversion chamber, and that from the secondary clarifier will be returned to the second chamber after which it will be refiltered. This recirculation will be accomplished by means of mixed-flow propeller-type pumps in wet wells located in the control house (Fig. 1).

Fig. 4. Parshall flume for measuring plant effluent.

Three pumps, of identical capacity, are provided for recirculation: each pump has a rated capacity of 2,100 gpm. against a total dynamic head of 10.5 ft. One of the pumps is of the variable speed type, permitting it to be coupled with either of the others to meet all expected variations in the flow.

Screenings will be removed from the sewage with the aid of a mechanically cleaned bar screen, with a manually cleaned screen as a standby. Screenings will be collected at regular intervals and be disposed of in the camp incinerator.

Designing engineers

Designed by Tuttle, Seelye, Place and Raymond, consulting engineers of New York City, under the direct charge of Elwyn E. Seelye, the plant was built under the direction of Col. A. B. Jones, district engineer, Corps of Engineers, New York City. Elson T. Killam, sanitary and hydraulic engineer of New York City, and Willem Rudolfs, chief of the Division of Water and Sewage, New Jersey Agricultural Experiment Station, reviewed the plans and basic design data.

City Prepares Plan for Routing Military Convoys

BY ADOPTING a practical routing system long before it was needed, Lynchburg, Va., has been successful in facilitating orderly and swift movement of military convoys through the city with a minimum of traffic difficulties, according to the American Municipal Association.

The problem confronts local authorities frequently today, especially in and near areas with large army training centers, the association said in describing the Lynchburg plan to accommodate troop movements through the city of 45,000. In developing its routing program Lynchburg officials kept in mind both the movement of military convoys and the possibility they might want to stop for rest periods or bivouac for the night.

First step was to make a preliminary survey of all main traffic arteries and secondary streets through the city. This survey, made by the city's traffic bureau with assistance of an army transportation officer, included analysis of congested areas, corner conditions and underpass and bridge capacities, and selection of vacant lots that might be useful for rest or bivouac purposes.

Maps given to Army

The initial study, made long before there were troop movements through Lynchburg, provided information for further study by the traffic bureau on the best ways to handle military convoys under various conditions. Maps of the city then were prepared by the engineering department showing routes and alternate routes for convoys, and rest and overnight areas. The routes were plotted to enable convoys to avoid bridges and underpasses, and areas and routes of civilian traffic movement and other population congestion.

Copies of the maps are distributed to advance officers in charge of troop movements as their convoys approach the city, and to officers in charge of convoy section pilot cars. The maps have proved effective in preventing sections or parts of sections from losing the main convoy while passing through the city, and in guiding troops separated from the main body for other reasons, the traffic bureau said.

As the routing plan now operates, convoys approaching Lynchburg are met by traffic officers detailed to escort the various sections over the selected route. Upon completion of one assignment an officer returns to the point of entry to escort other sections, with this routine carried on until the last section of the convoy has cleared the city.

In addition to traffic officers, whose number depends entirely upon the number of convoy sections, police radio cars are detailed to ride the convoy route to facilitate further the convoy's movement through the streets of the city.

No publicity is given to passage of military convoys, according to the traffic bureau, because it would attract large groups of civilian watchers and extra heavy civilian vehicular traffic along the route—conditions creating traffic hazards that should be avoided.

Shovels are the mainspring of many dirt-moving operations. Treat them well for better returns.

Getting the Most from Shovels and Cranes

***Contents in Brief**—Keeping construction equipment running, longer and faster, is a prime job of construction management today. Suggestions to this end, solicited from shovel and crane manufacturers include: warnings against counterweights, hints on speeding excavation by use of smaller buckets, and directions for proper methods of shovel bucket filling. Similar suggestions relating to other types of equipment are scheduled for future issues, and discussions of the subject from readers will be welcome for publication.*

THERE ARE MANY THINGS that the manager of equipment, be he owner, superintendent or foreman, can do to help operators get more output from the expensive machines that have been entrusted to him and yet make the machines last longer. Some of these things as they apply to shovels and cranes have been compiled from manufacturers' suggestions and are set forth here as an aid to those in control of machines to eliminate gross abuses and the causes of inefficient work.

The instruction books of the manufacturers, which come with every machine, tell adequately and exactly how to adjust, operate and repair each part. It is not the purpose of this article to cover this subject but it is suggested that such books should be carefully preserved as they are expensive to produce and in many cases are made up for the individual machine. When an operator leaves a job it is important to see that he also leaves the instruction book. However, if the instructions for a machine are gone, ask the manufacturer, on company letterheads signed by a responsible officer, to replace them, giving the exact identification of the rig.

Keep machines in first-class shape

With a well-kept, neatly painted machine, an operator can be depended on to do more work than with one whose dilapidated looks suggest inefficiency. Paint, of course, will not cover mechanical defects, but there is an incentive to make frequent although small repairs on a clean rig, whereas with a dirty one there is always the tendency to wait until it can be taken out of service for a complete overhaul.

On any machine it is cheaper and far safer to make repairs as soon as their need is known, especially now that replacements are difficult to obtain and repair jobs consist of fixing broken or worn parts rather than installing new ones.

Of the several ways suggested to reduce the necessity for repairs to equipment, avoidance of over-loading is the most important. Even the best of equipment operators can be guilty of overloading practices, with subsequent damage and early depreciation of equipment.

Probably the commonest way to overload a crane is by adding counterweights. Perhaps no serious harm results from the use of small additional counterweights if the speed of operation is slowed and the loads are handled carefully. The tendency, however, is to add and then forget the counterweight, leaving it as an extra burden on power and clutches. This results in an overload equal not alone to the added weight but increased by the extra load that can be lifted without over-turning when the counterweight is present.

Changing the governor to increase the motor speed beyond the safe limits established by the manufacturer and thereby increasing the horsepower is also a cardinal sin. Excavator designers provide safety factors of strength throughout their products, but the maximum safe power also is usually supplied. Wide margins of safety are required, particularly on power shovels, because the shovels are always subjected to shock loads. A hidden rock in otherwise easy digging can momentarily increase the stress in the entire machine, dipper stick and boom, cables, drums, frame, turntable rollers, center pin and crawler. Over-powering reduces the

safety factor and very materially increases the chances of breakage.

Output increased by underloading

Crane owners report that for digging operations with a clamshell bucket the next smaller capacity bucket below the rated shovel-dipper size of the machine is best. Most present day shovels of $\frac{3}{4}$-cu.yd. rating can handle, as clamshells, a $\frac{3}{4}$-yd. digging bucket on a standard length boom. The machines will handle this load safely but not at the maximum speed built into the excavator itself. When the boom is set for, say, a 20-ft. radius, and the bucket is fully loaded, the operator tends to slow the machine, slipping clutches to keep the speed down because "teetering" begins.

The same machine, working at the same radius with a $\frac{5}{8}$-cu.yd. digging bucket, will have increased stability that permits the operator to speed the entire operation. He will hoist, swing, dump, return and cast with confidence and speed that will more than make up for the smaller load carried on each trip. As a result, yardage is likely to be increased. But if it amounts to only the same quantity as with a larger bucket, the crawlers, roller path, turntable rollers and other related parts have not been subjected to such severe stresses and strains. The inertia against swinging and momentum against stopping the swing are reduced, and wearing parts on the machine will not need premature rebuilding so that the total cost of ownership and operation of the machine will be kept lower.

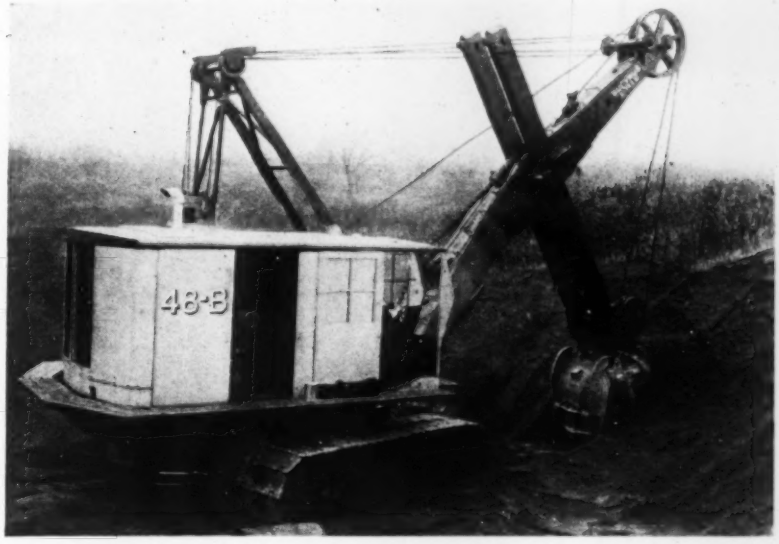
A full dipper at the top of the cut

A full dipper at the top of the cut is the real object in shovel operation. Many operators make the mistake of crowding the dipper too far into the bank at the bottom, filling the dipper before it has completed the cut. This uses extra power to push away material that the dipper cannot hold. If the dipper is crowded into the bank too far or too fast at the start of the cycle, the machine is, in effect, trying to lift all the material above the dipper, causing unnecessary stress and strain. Most efficient operation requires taking a uniform slice of the bank all the way from the bottom to the top, and such procedure will result in larger output as well as being easier on operator, machine and cable.

Digging into the bank deeper than the machine will readily cut often raises the rear of the machine. Some operators then allow the rear to drop, catching it with a foot brake, to assist in forcing the shovel through the cut. This results in severe wracking of the machine and in early cable replacement.

The shovel dipper or stick should not be used for side pushing, or sweeping as it is called. However, operators, whether experienced or not, follow this practice though there is no really harmless way to do it. Least damage will be done if the weight of the bucket is lifted from the ground by the crowd mechanism and only the teeth permitted to embed themselves in the earth. This will make the back of the bucket level and permit sweeping of soft dirt without doing serious damage. Rocks, boulders, heavy clay and other materials should never be moved by this method nor should trucks be pushed to assist them on their way.

Another abuse, easily noted, is the careless practice of allowing the dipper to strike the ground or one of the crawler treads during the swing of the turntable or while retracting the dipper stick as the bucket is returned to digging position. Large twists and strains can be thrown on the dipper stick and boom hinges in this manner, the amount depending upon the



The wrong way to dig. The dipper should be filled by a sweeping cut from bottom to top of the bank, not by lifting the entire bank above the dipper.

Do not lubricate the drag cable. This carries abrasive materials into sheaves and drums, doing more harm than good.

It is best never to add counterweights to a crane, but if they are added for special jobs be sure to remove them for normal operation. Counterweights add unnecessary dead-load.

speed of the swing. The tread or the latch on the dipper can be seriously damaged, and the stick, dipper and boom will require early repairs if this practice is continued.

Turn your wire rope

Wire rope that operates over sheaves should frequently be turned end-for-end to change the points of principal wear. This should be done before noticeable wear appears in the cables as otherwise a considerable portion of the strength of the rope will have been lost. The cable should be inspected often to determine if there has been undue stretching or if broken wires are present. Wire breaks may be detected visually or by running waste along the rope, the latter being a particularly good way to discover breaks in pre-formed rope, in which the wires do not splay. Some operators prefer the standard types of ropes rather than the pre-formed as frayed strands warn of wear.

Do not lubricate the operating cables that come in contact with dirt or excavated materials, as the lubricant will pick up dirt and pull it into the sheaves and machinery. Another difficulty with such lubrication is that as the cable wraps on the drum it has a tendency to heat from the friction and releases excess oil, often throwing it into the brake and clutch bands. Many manufacturers recommend cable with an independent wire rope center that has a treated core and consequently is less dependent on external lubrication.

All cables that do not go into the dirt should be oiled to prevent wear. A good lubricant that is capable of penetrating to the innermost strands and core of the rope and yet is sufficiently adhesive to resist being easily squeezed out or washed off should be used, and it should be applied when the cable is dry and clean. The moving cables, such as the hoist cable, should be serviced about every three or four shifts, more often if bright spots appear on the cable. The suspension cables and safety guys should receive the attention at least once a month as they are continuously exposed to the elements, and on steam machines are further exposed to corroding sulphur fumes in the smoke. All the oil company's have charts and are glad to supply technicians to recommend the proper lubricants.

Save on and by lubrication

The useful life of a machine probably can be extended 25 percent by really careful lubrication of every part of it. Experts in handling equipment recommend the personal attention of the operator for this important function, even giving him time to do the work himself or, at least, to supervise it. Perhaps the best general suggestion on this servicing is to apply the lubricant in small quantities, often and regularly, rather than in large quantities at infrequent intervals.

Ball and roller bearings are being increasingly used on big machines and require a special lubrication technique. Many such bearings are built with large grease reservoirs and require servicing at infrequent periods ranging from 20 shifts to as much as a normal operating season. A definite log should be kept of the greasing schedule on such bearings so that they will neither be over-lubricated nor neglected. When adding grease to such bearings, it is well to remember that heating is more often the result of too much grease than too little, as tight packing is detrimental to operation. Graphite will ruin a ball or roller bearing, even in small quantities, so it is necessary to thoroughly clean a gun that has been used with such grease before using it on roller or ball bearings.

No lubrication should be used on the travel rollers and treads of equipment operating in sand and dirt, as it carries abrasive particles into the small clearances allowed and quickly widen them to a point where parts replacement is necessary.

An operator should be made to feel free to call on others for assistance and advice on repair or maintenance rather than having his ability questioned if he does not pretend to know it all. There is an opportunity here to use the facilities and the well-trained staff of the usually nearby equipment distributor to get the best from the machines available.

How an A-E-M Contract Works

H. W. Richardson
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***Contents in Brief**—Successful operation of the new architect-engineer-manager form of construction contract is exemplified at an ordance plant in Wisconsin. The operator designs the manufacturing plant; all other design is by the A-E-M, who prepares plans and specifications for contracts to be let by the Army. The A-E-M supplies all materials, temporary and permanent, on both its own and contract operations. Handling of materials and labor has been worked out in detail. An efficient engineering, construction and management organization has been developed.*

WHEN the architect-engineer-manager (A-E-M) type of contract for war construction projects was announced early this year considerable doubt was expressed as to whether this form of contract procedure would be workable. Subsequent inclusion of a contractor for the management phase of operations lessened the doubt, but the new procedure remained to be proved. That this type of contract is workable is indicated by the experience of the Badger Ordnance Works in Wisconsin.

No doubt much of the contract's success here is due to the attitude of the three principals involved and their determination to make it work and get this essential plant built and into operation at the earliest possible moment. Major Wayne O. Houck, area engineer, representing the Corps of Engineers in charge of construction; the Hercules Powder Co., operator and consultant; and the Mason & Hanger Co., architect-engineer-manager, are working together and provide an excellent example of A-E-M contract procedure. The fourth interest involved, the U. S. Army ordnance department, is represented by Lt.-Col. Geo. Griffith, commanding officer. While not directly concerned with the engineering and construction contract, Col. Griffith and his staff of officers are available for advice and consultation.

Briefly, here is the set-up. The ordnance department has stated its requirements. With the cooperation of ordnance, Hercules and Mason & Hanger are working out details of the plant to meet the requirements. As operator-consultant, Hercules is designing all operating buildings, amounting to about 65 percent of the project, and is procuring operating

DETAILS OF ARCHITECT-ENGINEER-MANAGER ORGANIZATION

I—Engineering Department
(under chief engineer)

Sections and sub-sections

1. Design, office (chief designer)
   - a. Architectural
   - b. Structural
   - c. Electrical
2. Contracts (contract manager)
3. Construction engineering (construction engineer)
   - a. Field design
     - (1) Buildings
     - (2) Electrical
     - (3) Plumbing and heating
     - (4) Sewers and water
     - (5) Roads and railroads
   - b. Requisition of materials
   - c. Surveys
   - d. Prints and photostats
   - e. Inspection
   - f. Progress and costs
     - (1) Costs
     - (2) Estimates
     - (3) Reports

II—Construction
(under general construction supervisor)

1. Office (assistant supervisor)
   - a. Clerical
   - b. Expediters
2. Labor (general labor foreman)
3. Mechanical (asst. gen. supervisor)
   - a. Clerical
   - b. Storekeepers
   - c. Riggers
   - d. Machine installation
   - e. Repair shop
   - f. Field fabrication
     - (1) Machine shop
     - (2) Blacksmith shop
     - (3) Welding shop and portable welders
   - g. Transportation
   - h. Automotive maintenance
   - i. Service department
4. Construction supervision (asst. gen. supervisor each shift)
   - a. Plumbing and heating
   - b. Paint shop
   - c. Carpenter shop
   - d. Various const. units and areas
5. Track maintenance
6. Roads
7. Water and sewers (asst. gen. supervisors)
   - a. Water lines
   - b. Sewers
8. Electrical supervision
9. Sanitary services and janitors

III—Office and Accounting
(under office manager)

1. Materials (materials superintendent)
   - a. Field forces (asst. materials superintendents)
     1. Field expediters
     2. Watchmen, storage areas
     3. Storekeepers, yards and warehouses
     4. Materials clerks
     5. Oil houses
     6. Oil and fuel service stations
     7. Truck foremen
     8. Materials checkers
     9. Tool and equipment clerks
     10. Materials clerks
   - b. Inventory section
   - c. Chief clerk
   - d. Telephone and road expediters
2. Transportation (transp. supt.)
   - a. Car tracers
   - b. Rate clerks
   - c. Yardmaster
3. Purchasing (purchasing agent)
   - a. Buyers
     - (1) Electrical
     - (2) Tools and parts
     - (3) Millwork
     - (4) Plumbing and heating
     - (5) Office equipment
     - (6) Supplies
     - (7) Rental equipment
   - b. Chief clerk
     - (1) Auditor
     - (2) Invoices
     - (3) Rentals
     - (4) Disbursements
     - (5) Reimbursements
     - (6) General ledger
     - (7) Cost ledger
     - (8) Cashier
   - c. Payroll and time
     - (1) Payroll supervisors
     - (2) Timekeepers
     - (3) Payroll assistants
   - d. Personnel (personnel manager)
     - (1) Interviews
     - (2) Fingerprints
     - (3) Badges and photographs
     - (4) Contractor equipment
     - (5) Job assignment
     - (6) Files
   - e. Labor coordinator

equipment. Mason & Hanger, as A-E-M, is designing all non-operating facilities, such as warehouses, shops, roads, railroads and utilities. The firm of Greeley & Hansen have been retained as consultants on sewage disposal and water supply. Most of the construction work is being let as separate contracts, running from $50,000 to $500,000 each, by the area engineer under plans and specifications prepared by the A-E-M. To get the job rolling before plans were complete, the A-E-M built several highways within the site, temporary water and sewer facilities, power lines, shops and warehouses, and started one group of manufacturing buildings, all on a force-account basis. The A-E-M also maintains the roads and utilities.

On this project the A-E-M is furnishing all construction materials, both temporary and permanent, for all work, including contract items and force-account operations. The A-E-M is working on a fixed-fee basis, and the fee remains the same regardless of how much construction is done by A-E-M forces. All installation of operating equipment is by the A-E-M.

Every action taken by the A-E-M must be approved by the area engineer. He approves all drawings, specifications, purchase orders and invoices. An example of his control of the job is the fact that written permission must be asked and received from him before a tree can be removed.

Contract procedure

Under the A-E-M form of contract the work is divided up into fairly small units and let as separate lump-sum or unit-price contracts. The idea is to let contracts just as fast as plans are ready, with construction operations being generally supervised and coordinated by the A-E-M. Because on this project all materials are supplied by the A-E-M, the construction contracts are for labor, tools, equipment and supervision only.

While some designs are made by the operator-consultant, all plans and specifications are issued by the A-E-M, who also decides what units are to be included in a specific contract, and when the contracts are to be advertised. The area engineer advertises the work and receives bids in triplicate, and awards the contracts to the lowest qualified bidder. Usually about ten days are allowed for preparation of bids. In purchase of materials only, the A-E-M issues the call for bids and endeavors to get at least three tenders.

There is no uniform basis for dividing up the work. The various contracts are let according to the way plans are available and for expediting the job as a whole. For example, only excavation and foundations for a group of buildings may be let as one contract, their superstructure, plumbing and heating and electrical work as separate contracts. Again, special trades contracts may cut across several construction contracts. Roads and utilities and general grading are separate jobs. Furnishing of all concrete in transit mixers is still another contract.

The individual contracts comply generally to standard government requirements. Bid and performance bonds of 10 percent are required, as also are payment bonds of 50 percent up to $2,000,000 jobs, 40 percent to $5,000,000. Definite construction schedules and liquidated damages for delays are called for, except the contract time is extended (without right of claim) when the A-E-M is unable to furnish required materials. Contracts can be terminated at the convenience of the government.

Minimum wage rates are established, and overtime rates at 1½ times the hourly rate must be paid for more than 8 hr. per day and from 5 p.m. Friday to 8 a.m. Monday. On two or more shifts the work week is five days at 7½ hr. each, paid for at a daily rate of eight times the hourly rate. The contractor carries his own compensation, public liability and property damage insurance.

In addition to supplying all materials for the contracts, the A-E-M arranges and pays for testing them, and is responsible for their quality. Contractors are responsible for the care and storage of materials after delivery, and all temporary materials of salvage value must be returned in clean order. Waste and careless use of materials are charged against the contractor.

Acting as engineer, the A-E-M furnishes all lines and grades and inspects all construction work, both force-account and contractor operations. The area engineer office provides a few inspectors who act as observers or general inspectors as an overall check on operations. The A-E-M prepares periodic estimates of their own and contractor work, submitting them to the area engineer for payment.

Electric current for light and power and water are supplied the contractor without charge by the A-E-M. Power is taken off the low side of a transformer placed within reasonable reach of the contractor's operations, and water is supplied to a central point. With approval, the contractor may build temporary roads in his area, and he is responsible for damage he may cause utilities. The A-E-M provides first-aid, medical and sanitary services without charge.

Labor regulations

Most of the construction labor comes from union halls at a nearby city. Contractors may requisition labor directly from the unions or use the services of the job labor coordinator. The coordinator helps in distributing labor around the job. He is especially valuable in transferring men temporarily or permanently laid off by one contractor or the A-E-M to other construction units. This idea, similar to a labor pool, works to the advantage of the project, for it keeps labor on the job, reduces the turnover and pleases the workers who have made living and transportation arrangements. Two railroads run commuter trains from the city.

All employees are fingerprinted and examined by the government before employment. They must wear photo badges with a distinctive color background that designates the unit or area of employment. This complicates the operation of the labor pool somewhat, for upon change of employment the men must go back through the government labor office for another color badge. They are carried on separate payrolls, according to employment, which may mean issuing several checks to one man for a single payroll period.

All employees are under the jurisdiction of the project police, employed by the operator-consultant and supervised by the ordnance department plant protection service. Workmen are restricted to their own areas, and must use designated routes in traveling through the project.

Materials orders

The procedure set up by the A-E-M for obtaining and handling materials is rather elaborate, but has been very well organized. As fast as plans are developed the engineering

department prepares materials requirements lists. Then the materials department places the necessary orders as soon as possible, either for general stock or for specific use. The Army buys lumber at auction on A-E-M requisitions. Many small items, such as anchor bolts, are fabricated in the A-E-M shops, and the original material lists designate whether items are to be purchased or fabricated.

Three main advantages in the A-E-M furnishing all materials are: (1) Orders are placed as soon as possible, often far in advance of letting contracts, reducing delays because of slow shipments; (2) the A-E-M purchasing department knows all the ropes in priorities and procurement, and thus saves the individual contractors a lot of trouble; (3) often items for more than one contract or even the entire project may be ordered at once, getting the advantage of quantity prices. One big disadvantage is that the contractors must put all overhead, profit and contingencies in their labor charge, as there are no buffers in material costs to absorb these items.

Requisitions for materials originate in the following A-E-M departments: for construction—engineering and materials departments; for repair parts (shop stock)—mechanical department; for sanitary supplies—sanitary service department; for construction maintenance and equipment—construction department. All requisitions specify the use, when and where required, code number (account cost distribution) and the name of the requisitioner. Requisitions originating in the field are checked for cost distribution by the materials superintendent, then forwarded to the purchasing department, which obtains prices and approval of the area engineer and prepares final purchase order; four copies go to the materials department, six to engineering and one to the area supervisor.

Materials are checked in as received on original tally reports signed by material checkers for both the A-E-M and the Army. The tally report and accompanying shipping papers go to the posting section of the materials department, which proves all items as to proper purchase order, etc. Eight copies are then made of the tally report, containing the purchase order number, requisition order number, name of requisitioner, vendor and all other pertinent information necessary to the Army and A-E-M accounting officers, for distribution to the army field auditor, property and finance offices, the district engineer, the Chief of Engineers, and to the A-E-M warehouse and accounting departments. The original tally report, attached to the warehouse copy of the requisition order, is filed with the warehouse copy of the purchase order.

Tools and equipment delivered directly to the A-E-M employees are endorsed by the receiver as accepted in good order. A second copy of the tally is kept on file by the inventory section of the materials department.

On all items returned to the vendor or lessor the same general procedure is followed, except the original tally is marked shipping tally. The return of materials and equipment is initiated by alterations to original purchase orders.

Delivery and issuance

Items of direct charge are delivered upon receipt to the proper location or area if storage space is available, otherwise to central storage. Stock items go to one of the A-E-M warehouses.

Upon award of a contract the contractor furnishes the A-E-M with a list of required materials, both temporary and permanent. This list is checked against that made up by the engineering department, and also serves as guide in ordering temporary materials, such as form lumber. As the work proceeds on a contract the contractor requisitions materials as required. Often the A-E-M area supervisors anticipate the contractor's needs in advance, and they keep a constant check on materials requirements so the contractor will not be caught short.

The original and three copies of the contractor's requisition are submitted to the area supervisor, who marks the cost distribution and checks the list against the bill of materials compiled by the engineering department. After approval by the area supervisor these requisitions are distributed to the materials superintendent, the contractor, the general construction supervisor and to files.

A stores requisition then is issued by the materials department, signed by the contractor, with copies going to the cost department, materials department, area supervisor, contractor and area engineer. Requisitions for materials in stock go to the inventory section of the materials department, where they are checked and extended for the A-E-M and Army cost departments.

If available materials are insufficient or are requisitioned by two or more contractors, resulting in a shortage, the general supervisor of construction decides how the available materials are to be distributed. No requisition from a sub-contractor is honored unless the contractor has designated that party as his representative.

The contractor may be required to accept and store direct-charge items as soon as received on the project. In such cases no further requisition is required, but five copies of the issue report are made out and forwarded as outlined above.

Tools, equipment and concrete

Tools and equipment ordered for a specific department are turned over to the department head, and records are kept in the materials department. Inventories are made of such items at periodic intervals. Personal use items are signed for by the receiving individuals and upon termination of employment final paycheck is not issued until the individual has cleared through department storehouses and tool rooms. Broken and worn-out tools must be returned for replacement, and the departments are credited for all such items.

As all concrete is furnished under contract via transit mixers, all contractors and A-E-M superintendents report at 4 p.m. their concrete requirements for the next day. These reports are sent to the concrete superintendent. In case of excess requirements over concrete plant capacity, the general construction supervisor decides on priority of deliveries. Receiving tickets accompany each mixer load, and the area supervisor marks the cost distribution on each load ticket, copies of which are sent to the plant inspector, the cost department and the area supervisor's file.

A-E-M organization

Obviously a sound and efficient organization is required to direct a project of this magnitude. Authority in the Mason & Hanger Co. stems from the board of directors through two resident vice-presidents, Sam Mason, II and Guy W. Sackett. Hor-

ace M. Buck is project manager for the A-E-M, assisted by Charles H. Donohue.

The A-E-M organization is divided into three main divisions: I—Engineering, headed by L. E. Gradick, chief engineer; II—construction, headed by Abb Carroll, general construction supervisor; and III—office and accounting, headed by O. F. Lamparter, office manager. A further breakdown of the organization is given in the accompanying table. One feature of this organization is the area supervisors. These men coordinate and supervise in general the contractors in a certain area or engaged in building certain units. They also act as superintendents on force-account operations.

For the Corps of Engineers, in charge of construction, Major Wayne O. Houck, area engineer, reports to Major George Kumpe, district engineer, Milwaukee. The project comes under the general direction of the Great Lakes division engineer at Chicago, Col. L. D. Worsham.

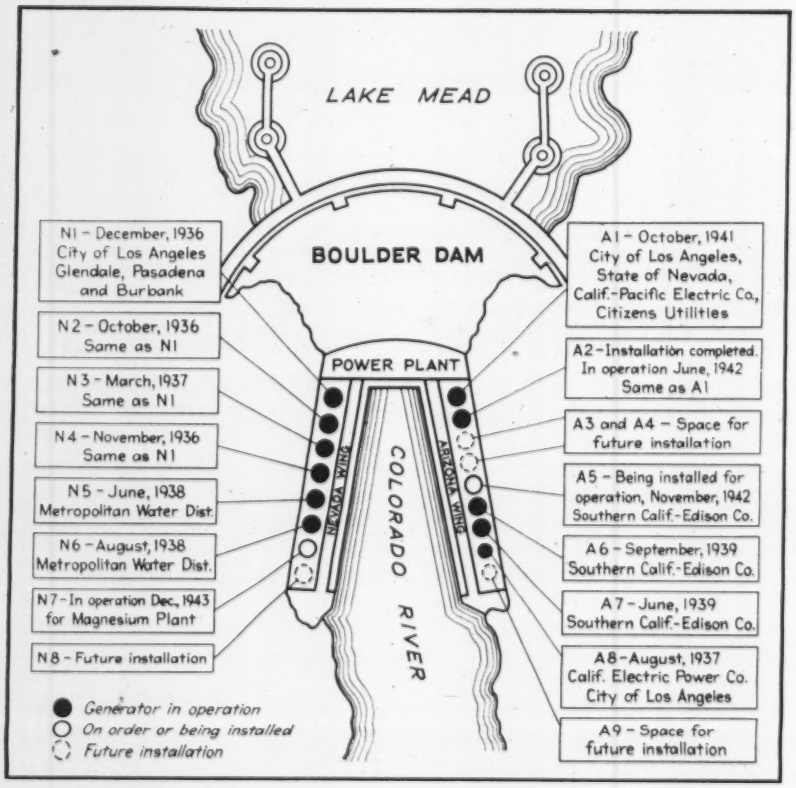
Conclusions

Observation of operations under the A-E-M form of contract lead to a few general conclusions: The A-E-M does just about as much work and has about the same organization as if it were architect, engineer and general contractor doing all construction. It is saved some financing expense, however. This type of contract does not speed up the work, in fact it probably slows up progress to some extent because of time lost in getting plans and specifications ready for bidding and in advertising and awarding contracts.

It does divide the work up so small contractors have a chance to bid, but a rather high ratio of liquid assets to value of work is required to carry the contractor through the early stages because of time required to clear the estimates through the Army accounting offices. At times the A-E-M is not able to designate priority of operations in the specifications, which later may cause some confusion when two or more contractors are working in the same area. More and more coordination and skill in direction will be required of the A-E-M as the number of contractors increase. Close control of labor is necessary to prevent "pirating" of labor by one contractor at the expense of another of the contractors on the job.

All in all, however, the A-E-M contract is working out very well on this project, and will work the same on other jobs where the principals involved assume the right attitude and try to cooperate in making the plan work.

War Speeds Generator Installation In Power Plant at Boulder Dam


LAKE MEAD
BOULDER DAM
POWER PLANT
COLORADO RIVER
NEVADA WING
ARIZONA WING
N1 – December, 1936 City of Los Angeles Glendale, Pasadena and Burbank
N2 – October, 1936 Same as N1
N3 – March, 1937 Same as N1
N4 – November, 1936 Same as N1
N5 – June, 1938 Metropolitan Water Dist.
N6 – August, 1938 Metropolitan Water Dist.
N7 – In operation Dec., 1943 for Magnesium Plant
N8 – Future installation
A1 – October, 1941 City of Los Angeles, State of Nevada, Calif.-Pacific Electric Co., Citizens Utilities
A2 – Installation completed. In operation June, 1942 Same as A1
A3 and A4 – Space for future installation
A5 – Being installed for operation, November, 1942 Southern Calif.-Edison Co.
A6 – September, 1939 Southern Calif.-Edison Co.
A7 – June, 1939 Southern Calif.-Edison Co.
A8 – August, 1937 Calif. Electric Power Co. City of Los Angeles
A9 – Space for future installation
Generator in operation
On order or being installed
Future installation

Present status of the power installations at Boulder Dam. Dates given for the completed units are the dates at which they went into service. Also given is the name of the agency to which the power from each unit is sold or is to be sold upon completion of the unit. Large units are of 82,500-kw. capacity; smaller units in Arizona wing are 40,000-kw. capacity.

Installation of the tenth 82,500-kw. generator in the power plant at Boulder Dam was completed in June; the eleventh unit will go into service in November of this year, and the twelfth will be ready for service in December 1943. The latter unit will supply power to the new magnesium plant at Las Vegas, Nev., now under construction. Thus, by the end of next year, war demands will have raised the installed capacity of the plant at Boulder to 952,300 kw.

The powerhouse at Boulder Dam has place for 15 units of 82,500 kw. capacity (115-hp. turbines) and for two 40,000-kw. capacity units. There are also two small station units, not shown in the accompanying drawing, of 2,400 kw., or a total of 1,322,300 kw. The first regular service was inaugurated in October 1936.

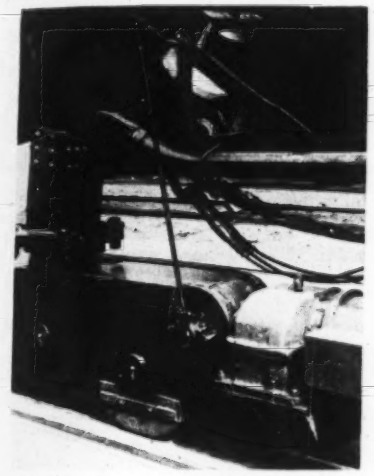
Installation of the new unit is being carried out by the U. S. Bureau of Reclamation, which built the dam and powerhouse. The bureau also has charge of the sale of power. Last year new power rates were established, the firm energy rate now being 1.163 mills per kw.hr. and the secondary rate 0.34 mills per kw.hr. The accompanying drawing is reproduced from one in the February 1942, issue of *The Reclamation Era*, published monthly by the Bureau of Reclamation until its publication was suspended "for the duration."

From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

Automatic Bell for Gantry Crane

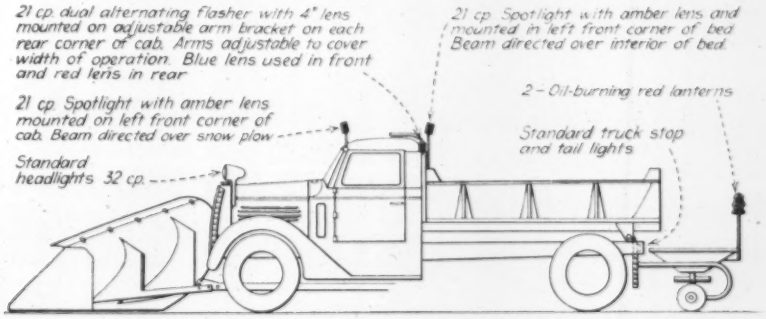
Gantry cranes in shipyards must move along flush tracks across which workmen are continually passing. Safety requires some form of sound device to give warning of the approach of these cranes and this need has been met effectively in one western yard by the bell-ringing rig here shown. A locomotive bell is mounted on a frame where it can be rocked by a lever arm actuated by a cam attached to the end of one of the drive shafts. Relative arm lengths are made such that revolution of the actuating cam tilts the bell only enough to cause the clapper to strike once for each revolution. A light spring is attached to the clapper to regulate its motion as desired.



Attachment to crane truck rings locomotive bell continuously when crane is moving.

Added Lights on Ohio Snowplow Reduce Accidents

The Ohio State Highway Department, after 2½ yr. of experimentation, has developed for snow plows and cinder spreaders a flashing signal system that is highly visible to motorists when the state equipment is removing snow from the highways. Although such equipment has always had some lights, the increasing number of collisions had been a matter of much concern.


21 cp. dual alternating flasher with 4" lens mounted on adjustable arm bracket on each rear corner of cab. Arms adjustable to cover width of operation. Blue lens used in front and red lens in rear
21 cp. Spotlight with amber lens mounted on left front corner of cab. Beam directed over snow plow
Standard headlights 32 cp.
21 cp. Spotlight with amber lens and mounted in left front corner of bed. Beam directed over interior of bed
2 – Oil-burning red lanterns
Standard truck stop and tail lights

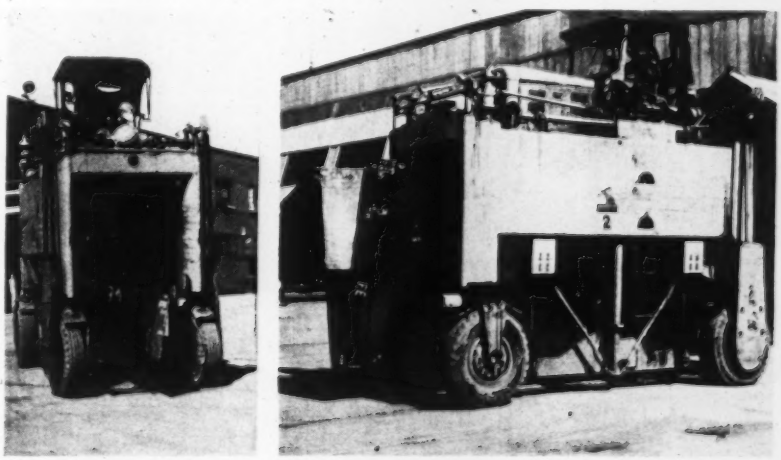
Because lighting arrangement (above) proved so satisfactory for snow-removing equipment, Ohio highway department carried out 500 such installations.

As a result the special lighting system illustrated, consisting of a double-faced flashing warning light has been installed on snow plows on each side of the cab. These lights flash alternately approximately 80 times per minute, and each light is mounted on an extension arm supported by brackets near the top of the cab. The arms can be extended to place the lights at full width of the snowplow's blade. The lights are equipped with 21-cp. bulbs and have a blue lens in front and a red lens in the rear. Because of the heavy drain on the truck's batteries by the light and other equip-

Carriers for Steel Plate Racks Speed Deliveries in Shipyards

Carriers for moving racks in which steel plates are stored expedite operations in West Coast shipyards. The rig, of which two views are shown in the accompanying picture, is very similar to the lumber carrier, with gasoline engine and operator's station on top of a four-wheeled framework that can straddle the load and then lift it by means of sturdy steel arms extended beneath the rack or frame.

In some yards these units are equipped with an automobile horn so mounted that whenever the vehicle is in motion the horn sounds at intervals proportional to the speed of the driving mechanism. Workmen regularly employed near this device thus have a two-fold warning: not only does the horn give notice of approach of the vehicle but the time interval gives definite indication of the speed at which it is moving.



End and side views of a steel "heister". Note that the steel plates are in a rack which is picked up bodily by the carrier.

ment, such as headlights, heater, and defrosters, extra heavy-duty batteries and generators are required for proper operation.

A preliminary test of the flashing lights made during the winter of 1940–1941 proved so effective as a safety measure that 500 such installations have been made this winter. For the Ohio State Highway Department, H. D. Metcalf is chief engineer of maintenance, and Clyde C. Hadden chief of motor transports.

Steel Tank for Water Storage Gets No Repairs in 39 Years

In the light of present practice which prefers to substitute other materials for steel tank bottoms to avoid risks of corrosion and deformation, experience of the San Francisco Water Department with a 700,000-gal. tank (60 ft. in diameter and 34 ft. high) affords an interesting example of long service for steel bottoms without any special pretreatment and no maintenance at all carried out.

The tank was built in 190[illegible] on firm foundation with the bottom resting on shallow sand over a rock formation. The interior was given the usual treatment—three coats of asphalt paint applied by hand. Since then the tank has been in continual service and was partly emptied only once, some 12 years ago, for inspection. At that time the interior coating seemed to be in good shape and no maintenance work was done.

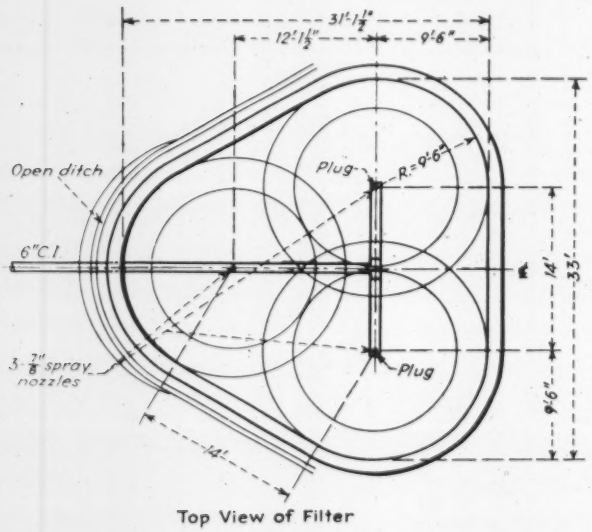
SEWAGE DISPOSAL PLANT FOR SMALL CAMPS

In dense clay regions, economical sewage treatment for rural hotel or school populations up to 300 has been provided by installing a three-nozzle trickling filter enclosed in masonry walls built of old fence stone. The layout shown requires a minimum of excavation and also gives a maximum of efficiency of use. Practically the entire bed area receives spray. If properly crushed rock is not available, a supply can be made either by use of a small crusher or even by hand breaking, choosing for this purpose the best available fieldstone.

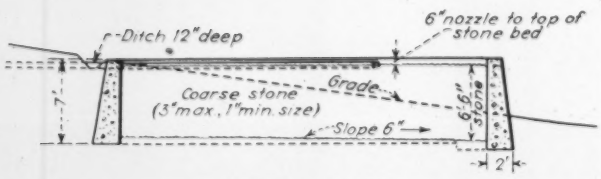
The effluent from the filter can be distributed into the topsoil layer, preferably in fairly heavy vegetation or wooded areas, by two lines of open tile each 100 ft. long.

If chlorine treatment of the effluent is desired, the simplest method is a drip inclusion of a high-test hypochlorite solution. A simple device is shown, easily constructed, with only a minimum of materials. The necessary chlorine addition to give a residue of 0.5 ppm. can be determined from the result of a test of the effluent. Any civilian, after a simple lesson, can operate this type of chlorinator, knowing the value of flow (based on population) and the strength of the solution. The simpler the formula prepared by the engineer who instructs the operator, the less chance of error.

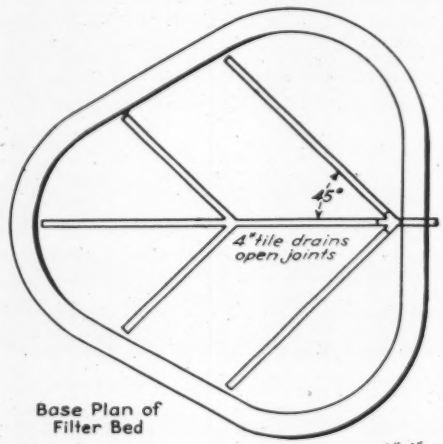
This type of disposal plant has been designed by the writer for a number of summer camps and hotels, situated in localities where drainable soil is not found and where sand costs are too high for economic filter bed construction. It has proved quite successful and economical and is suggested for emergency refuge camps if located in clay soil regions.—JACOR FELD, *Consulting Engineer, New York City.*



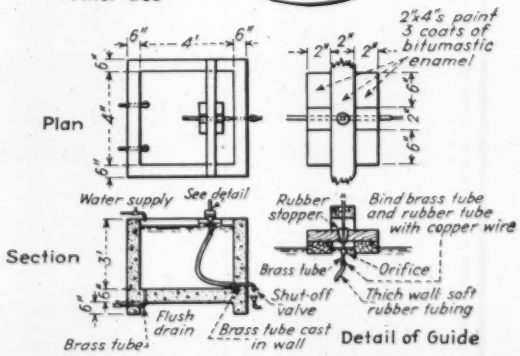
Top View of Filter



Cross Section of Filter



Base Plan of Filter Bed



Equipment for Feeding Hypochlorite Solution

TECO Timber Construction *Cuts Cost*

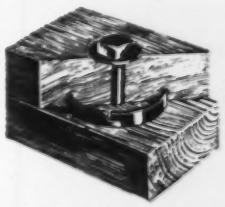
OF MORENCI LAUNDERS TRESTLES

Savings in time, timber and hardware... advantages in design... win mining engineers to TECO System

As one Phelps Dodge engineer, explaining why the TECO System was used in part of the construction of the Morenci Reduction Works, said:

"In our opinion, timber connectors were more economical than plain, bolted connections because we were able to develop the necessary strength at the intersections of bracing members and posts without the use of scabs and without perforating the members excessively. The braces are simply tapped across the posts. There were considerable savings in bolts and washers but the chief advantage seemed to be in the savings due to the reduction of labor and of the sizes of some of the main members."

For complete data on TECO and typical designs for large and small structures . . . write us today.



The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood.

Timber ENGINEERING COMPANY

WASHINGTON D. C. ★ PORTLAND, OREGON

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

BRIDGE, NORTH CAROLINA

OWNER: North Carolina State Highway and Public Works Commission, Raleigh.

PROJECT: Construction of bridge over New River on North Carolina Route 172, Onslow County, N. C. Structure is swing span riveted, center bearing, steel truss, with balancing wheels and tracks; full circular rack, center and end wedges. Span: length 168-ft.; height 28-ft.

CONDITIONS: Contractor to furnish all materials and complete work in 175 days. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, 55c. per hr.; semi-skilled, 35c.; common, 30c.

LIST OF BIDDERS: Bids opened May 14, 1942.

1. R. H. Small, Charlotte, N. C. (contract) $288,630
2. F. A. Triplett, Chester, S. C 294,009
3. Wannamaker & Wells, Inc., Orangeburg, S. C 336,489

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Removal of exist. structures	L.S.	$5,500.00	$8,000.00	$8,000.00
2 Class A concrete	1,707 c.y.	37.50	35.00	45.00
3. Reinforcing steel	715,860 lb.	.0575	.06	.064
4. Struct. steel (303,000 lb.)	L.S.	31,500.00	33,936.00	34,700.00
5. Creosoted struct. timber	84 Mbm.	178.00	200.00	200.00
6. Creosoted timber piles	10,200 l.f.	1.65	1.45	1.85
7. 20-in. precast conc. piles	5,970 l.f.	5.80	6.60	7.10
8. 22-in. precast conc. piles	4,410 l.f.	6.50	6.75	7.75
9. Test piles (unloaded timber) for determining length of conc. piles	5 ea.	500.00	400.00	450.00
10. Test piles (unloaded timber) for determining length of timber piles	2 ea.	250.00	100.00	150.00
11. Mineral surf. asph. plank wear. surf.	479 s.y.	3.20	3.00	4.00
12. Operator's house	L.S.	800.00	1,400.00	1,250.00
13. Electrical equipment	L.S.	12,050.00	12,980.00	15,400.00
14. Safety gates (4)	L.S.	2,000.00	1,800.00	2,400.00
15. Machinery (48,000 lb.)	L.S.	32,000.00	28,800.00	35,408.00

HIGHWAY, TENNESSEE

OWNER: Tennessee Department of Highways and Public Works, Nashville, Tenn.

PROJECT: Improvement of 6.988 miles of highway in Henry County, between Paris and Routon, Tenn. Includes all necessary roadway, drainage, borrow and culvert excavation; concrete pavement, both 8-6-8-6-8-in. and 7-in. uniform; curbing; gutters; sidewalk; railroad crossing section; culvert extensions; and side drain and sewer pipe. Roadway width 22-ft.

CONDITIONS: Contractor to furnish all materials and complete work in 100 working days. Rail and highway transportation facilities available near site of work. There are high fills and deep cuts involves in construction of this heavily traveled access road. Wage rates are: skilled labor, 75c. per hr.; semi-skilled, 45c.; and unskilled, 30c.

BIDS: Five bids were opened May 1, 1942, ranging from the contract low of $314,716 to $325,702.

LIST OF BIDDERS:

1. F. C. Gorrell & Sons, Russellville, Ky. (contract) $314,716
2. Bowyer & Johnson, Jackson, Tenn 318,872
3. Lehman-Roberts Co., Memphis, Tenn 318,994
4. Ziegler Constr. Co., Nashville, Tenn 321,064
5. Foster-Creighton Co., Nashville, Tenn 325,702

Item	Quan.	Unit Prices (1	(2	(3
1. Rdwy. and drainage excav. (uncl.)	10,150 c. y.	$0.48	$0.40	$0.40
2. Borrow excavation (unclassified)	34,100 c. y.	.48	.50	.40
3. Culvert excavation (unclass.)	2,661 c. y.	2.25	1.50	1.50
4. Sodding	89,905 s. y.	.36	.40	.35
5. Cem. conc. pavmt. (plain) 8-6-8-6-8-in.	93,529 s. y.	2.28	2.37	2.46
6. Cem. conc. pavmt. (plain) 7-in.	4,525 s. y.	2.60	2.47	2.51
7. Cement conc. raised edge	23,775 l. f.	.10	.10	.10
8. Treated timber	4 893 Mbm.	200.00	175.00	150.00
9. Class A concrete	207.9 c. y.	35.00	25.00	20.00
10. Class B concrete	139.49 c. y.	32.00	[illegible]	20.00
11. Brick masonry	0.553 M	100.00	[illegible]	50.00
12. Concrete sidewalk	262 s. f.	.40	[illegible]	.50
13. Concrete curb	12.2 c. y.	30.00	[illegible]	22.00
14. Conc. combined curb and gutter	8.1 c. y.	30.00	[illegible]	22.00
15. Railroad crossing section	48 s. y.	6.00	[illegible]	4.00
16. 18-in. conc. pipe culvert (exten.)	38 l. f.	3.00	[illegible]	1.75
17. 30-in. conc. pipe culvert (exten.)	42 l. f.	6.25	[illegible]	4.50
18. 15-in. conc. sewer pipe (non-rein.)	612 l. f.	1.50	[illegible]	1.10
19. 18-in. conc. sewer pipe (non-rein.)	6,332 l. f.	2.00	[illegible]	2.00

HIGHWAY, KENTUCKY

OWNER: Kentucky Department of Highways, Frankfort.

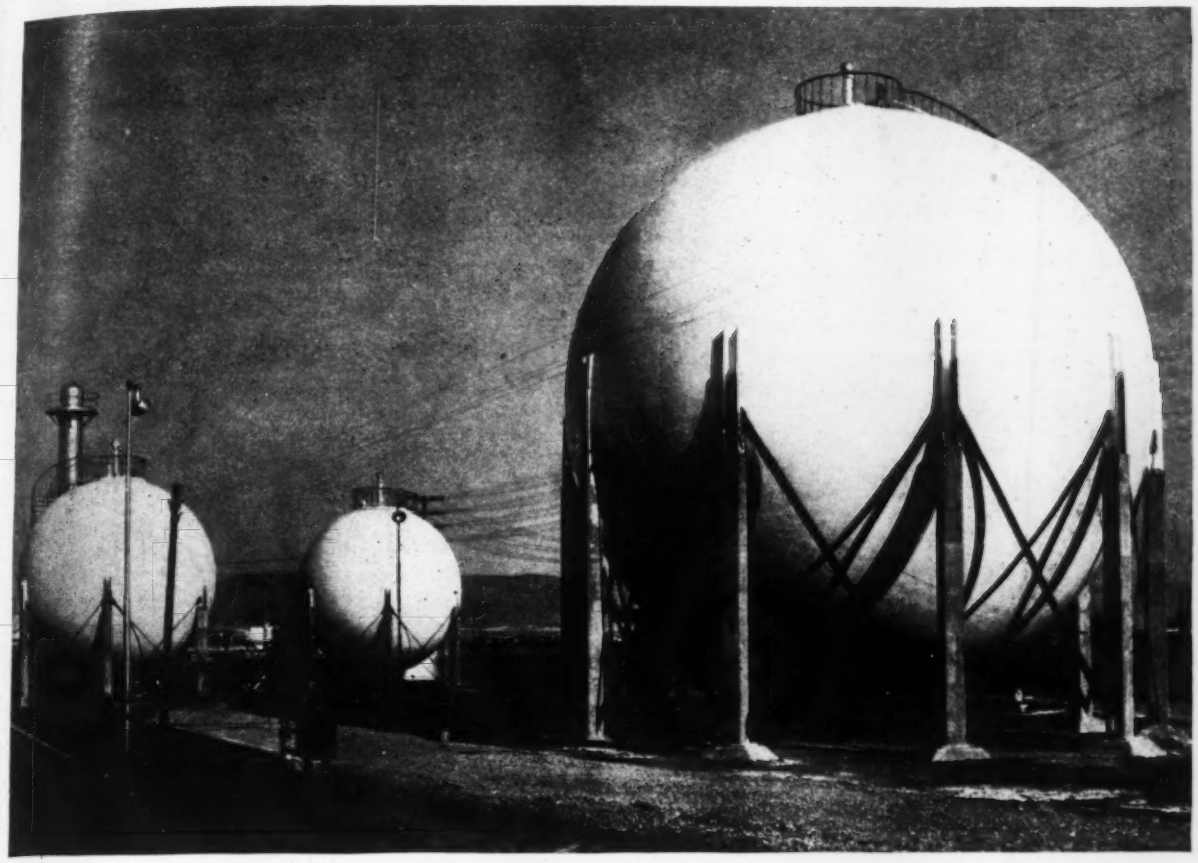
PROJECT: Non-reinforced cement concrete paving 10.727 miles of Elizabethtown-Fort Knox Road, Hardin County, Ky., beginning at end of improved street in Elizabethtown and extending to Radcliff. Roadway width 22-ft.; thickness of concrete 8-in. Bids on alternate types of surfacing were asked as follows: cement concrete pavement (reinforced); cement concrete pavement (non-reinforced); rock asphalt-cement concrete base; or bituminous concrete Class I—cement concrete base.

CONDITIONS: Contractor to furnish all materials and complete work in 175 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.25 to $1.50 per hr.; semi-skilled, 70c. to $1.50; common, 67½c.

LIST OF BIDDERS: Bids opened May 15, 1942.

1. Ellis, Kelly Co., and Fount Crow, Owensboro, Ky. (Non-reinforced concrete) (contract) $421,791
2. White Consolidated, Inc., Chicago, Ill. (Reinforced concrete) 444,116
3. F. C. Gorrell & Sons, Russellville, Ky. (Non-reinforced concrete) 449,024

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove trees and stumps	5 ea.	$10.00	$10.00	$10.00
2. Clearing and grubbing	8.24 ac.	20.00	100.00	50.00
3. Roadway excavation	18,006 c.y.	.45	.60	.50
4. Struct. excav., unclassified	1,264 c.y.	2.00	1.50	2.00
5. Rural lip curb box inlet, type 2	1 ea.	100.00	100.00	75.00
6. Flumes	300 l.f.	2.00	2.25	2.00
7. Flume inlets	16 ea.	75.00	75.00	75.00
8. Manholes	3 ea.	125.00	90.00	125.00
9. 15-in. rein. conc. culv. pipe	228 l.f.	1.75	1.35	2.00
10. 18-in. rein. conc. culv. pipe	219 l.f.	2.10	2.20	2.25
11. 24-in. rein. conc. culv. pipe	414 l.f.	2.90	3.00	3.50
12. 30-in. rein. conc. culv. pipe	705 l.f.	3.75	4.00	4.50
13. 36-in. rein. conc. culv. pipe	87 l.f.	4.85	5.00	6.00
14. 15-in. rein. conc. entrance pipe	772 l.f.	1.60	1.50	1.50
15. 18-in. rein. conc. entrance pipe	110 l.f.	2.00	2.50	2.00
16. 24-in. rein. conc. entrance pipe	88 l.f.	2.65	3.25	3.00
17. Concrete sidewalk	2,320 s.y.	2.25	2.20	2.25
18. Class A concrete	55.5 c.y.	25.00	27.50	35.00
19. 6-in. concrete pavement	195 s.y.	2.50	2.15	2.50
20. Water	5,555 hund. gal.	.20	.25	.25
21. Scarifying and reshaping	10,000 s.y.	.05	.05	.03
22. Final dressing	566 sta.	10.00	12.50	10.00
23. Removing pipe	1,219 l.f.	.50	.75	.50
24. Relaying pipe	136 l.f.	.50	1.00	.75
25. Remove pipe headwalls	7 ea.	5.00	60.00	10.00
26. Remove and rebuild stone masonry headwalls	4 ea.	20.00	150.00	25.00
27. Remove concrete masonry	31 c.y.	5.00	4.00	7.50
28. Remove concrete sidewalk	13 s.y.	.50	.25	.50
29. Remove concrete pavement	38 s.y.	1.00	.40	1.00
30. Remove concrete gutter	41 l.f.	.50	.25	.50
31. Remove concrete curb	24 l.f.	.50	.25	.50
32. Remove, reset hedge fence	180 l.f.	1.00	.50	.50
33. Concrete ditch paving	600 l.f.	2.00	1.00	1.50
34. Surface ditches	400 l.f.	.25	.10	.10
35. Pavement cross-overs	4 ea.	200.00	100.00	200.00
36. 15-in. curb inlets	9 ea.	45.00	75.00	100.00
37. 18-in. curb inlets	2 ea.	50.00	150.00	100.00
38. Crushed limestone for entrances	510 ton	2.50	2.50	2.50
39. Steel reinforcement	2,460 lb.	.08	.07	.10
40. Struct. excavation, common	75 c.y.	2.00	1.00	2.00
41. Struct. excav., solid rock	5 c.y.	5.00	3.00	10.00
42. Remove existing structures	1 ea.	1,000.00	150.00	2,500.00
43. Cem. conc. pavement (reinforced)	157,510 s.y.	.....	2.45	.....
44. Lip curb	17,600 l.f.	.....	.15	.....
45. Trench and shoulder excavation	14,700 c.y.	.....	.35	.....
46. Integral curb	4,945 l.f.	.....	.50	.....
47. Permanent traffic stripe	62,015 l.f.	.....	.05	.....
48. Cem. conc. pavement (non-rein.) alt	157,510 s.y.	2.35	.....	2.48
49. Lip curb (Alternate)	17,600 l.f.	.10	.....	.08
50. Trench and shoulder excavation (Alt.)	16,800 c.y.	.30	.....	.40
51. Integral curb (Alt.)	4,945 l.f.	.45	.....	.50
52. Permanent traffic stripe (Alt.)	62,015 l.f.	.03	.....	.04



PRESSURE STORAGE TANKS have gone to WAR

Hortonspheres and Hortonspheroids are peace time creations for peace time service. They were developed after World War I when everyone was trying to make the world a better place to live. Now—to serve the same purpose—they have gone to War.

. . . . in Powder Plants

Hortonspheres provide an economical means of storing anhydrous ammonia in relatively large quantities under pressure. Installations are usually designed to operate at 50 lbs. per sq. in., sufficient to materially reduce the evaporation losses that would otherwise take place.

. . . . at Lighter-than-air Bases

Helium can be handled and stored economically and safely in Hortonspheres. A single installation will release for other service many cylinders needed for transportation purposes.

. . . . making Aviation Gasoline

Spheres and spheroids are commonly used for handling and storing charging stock and finished aviation gasoline, as well as for blending this essential product. They prevent evaporation loss which so often results in the lowering of product quality as well as volumetric loss.

. . . . for Synthetic Rubber

These wonder plants that have Mother Nature's rubber trees slated for obsolescence need pressure storage at every step from the charging stock to the magic Butadiene. Spheres of different sizes for different pressures, usually from 50 to 100 lbs. per sq. in., will keep streams of the vital ingredients for synthetic rubber flowing smoothly and at top speed to the rubber making units.

Yes! In these and many other fields, Pressure Storage has gone to War.

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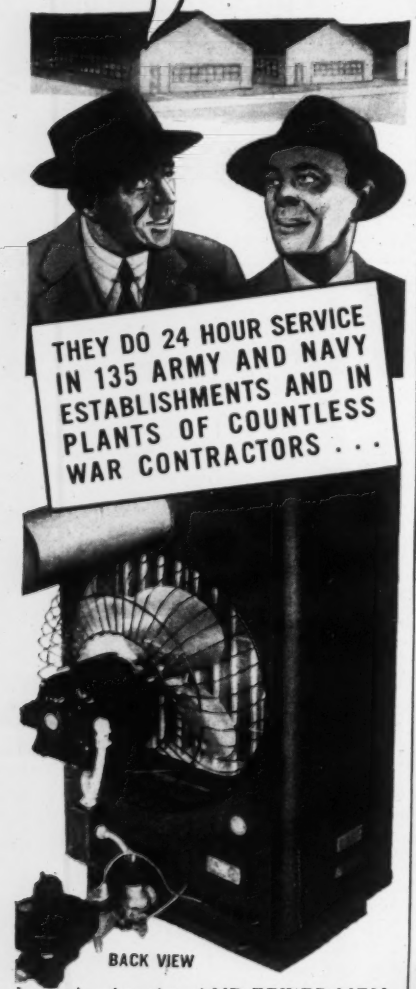
Plants in BIRMINGHAM, CHICAGO, and GREENVILLE, PENNA. In Canada—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

YOU'LL SAVE MANY HOURS INSTALLATION TIME BY SELECTING REZNOR SUSPENDED GAS UNIT HEATERS



It requires less time AND FEWER MEN to install Reznor Suspended Gas Fired Unit Heaters. Furthermore, 89% less of hard-to-get vital materials are required than for cast radiation systems. In addition, Reznor Heaters distribute MORE WARM AIR IN WINTER, GREATER AIR CIRCULATION IN SUMMER. One manufacturer of airplane parts said: "We feel very fortunate in having them (Reznors) installed in our plant." Write for catalog showing all types and sizes of heaters.

REZNOR MFG. CO., 105 James St., Mercer, Penna.

"GAS HEATERS EXCLUSIVELY SINCE 1888"

New Aids to the Constructor

Equipment and material announcements and manufacturers' news

Cement Mixer Unit

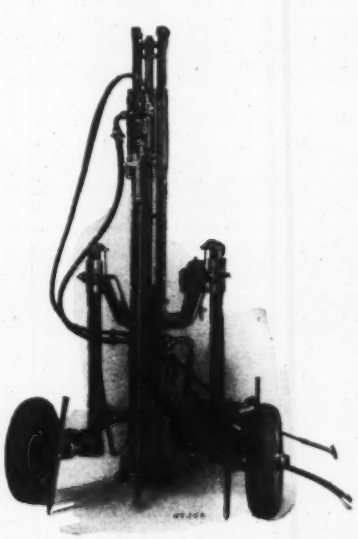
Twenty 5-cu.yd. Jaeger high-dump cement mixers mounted on Euclid Model 14FD chassis and powered by 150 hp. Cummins diesel engines have recently been completed for the U. S. Engineers. These units will be used for the building of military roads, airports, and other construction requiring off-the-highway transportation of materials. By removing the mixer unit and making minor structural changes, the chassis can be converted into a standard rear-dump Euclid for the hauling of earth, rock and other construction materials.—*The Euclid Road Machinery Co., Cleveland, Ohio.*

New Use for Steel Wool

A new use has been found for steel wool, according to manufacturers. A vital use for Type-A Ribbon American Steel Wool, produced by the American Steel Wool Mfg. Co., is for the removing of burrs from non-ferrous metals. This spindle is a very simple tool to make—by wrapping Type A Ribbon Steel Wool around the small shaft and then mounting the complete shaft or spindle in a chuck. In a single operation, it is possible to clear burrs from three sides and two edges. The spindle makes no permanent grooves.—*American Steel Wool Mfg. Co., Inc., 42-24 Orchard St., Long Island City, N. Y.*

Cellular Glass Block

An unique cellular glass—made up of thousands of tiny airtight cells and weighing only one-fifteenth as much as ordinary glass—has been introduced by the Armstrong Cork Co., as a permanent addition to its line of low-temperature insulating materials. This new non-critical domestic product, which presents glass in a new form, will be known as Armstrong's Foamglas. It offers permanent insulating efficiency for cold storage rooms and in various other low-temperature fields. The unusual cellular structure of Foamglas results in the formation of a slight vacuum within the cells that provides a highly efficient barrier to the passage of heat. The material can be stored and worked with ordinary tools and can be shaped for installation in almost any location.—*Armstrong Cork Co., Lancaster, Pa.*



Drifter

New features have recently been added to the X-71WD Drifter, manufactured by Ingersoll-Rand Co. This drifter has been developed for wagon drill service, in which the drilling of deep holes is usually required. New features include a positive method of blowing—a method which directs more blowing air through the drill steel. Thus, little air escapes around the sides of the tank. This is considered a major improvement over the method formerly used, since it virtually eliminates the wastage of air and directs a strong, steady current to the bottom of the hole where it is needed for cleaning. The X-71WD has a longer stroke and a heavier piston than any other drill made today. These features—long stroke and heavy piston—provide strong rotation and striking force neces-

sary to overcome the inertia of a heavy drill steel.—*Ingersoll-Rand Co., 11 Broadway, New York, N. Y.*

Color added to Ritecure

Ritecure, the original colorless membrane curing for retaining moisture in concrete during the setting period, now has a color added that shows the operator and inspector quickly where the material has been used. This is a material introduced into standard Ritecure that gives a green color when first placed, but disappears entirely in a few hours, leaving a colorless membrane.

In addition to making the temporary color available, if desired, the effectiveness of Ritecure has been said to be substantially increased. The compound now contains over 60 percent solids, said to be 25 percent greater than any similar compound heretofore produced. The material can still be sprayed as easily and effectively as ever. The flash point has been increased to about 150 deg. F., thus abating practically all fire hazard. —*Johnson-March Corporation, 52 Vanderbilt Ave., New York, N. Y.*

New Model Angle Meter

Engineers, welders, sheet metal workers, maintenance men, and others, will be interested in a new Model Angle Meter being released by the Interstate Sales Co. The meter is said to extend the range of angles of bend up to 126 deg.; enables laying out of bends and Y's directly on pipe, sheet metal, etc.; requires no calculations; available flat for shop use, or folded for field use; overall size is 12 in. x 12 in.—*Interstate Sales Co., 1123 Broadway, New York, N. Y.*

Mineral Surfaced Siding Board

Close on the heels of its newly developed corrugated asphalt siding, Certain-teed Products Corporation has brought out a new mineral surfaced siding board. Like its companion products, the new mineral surface board provides a readily available material for use on outside walls or structures of all kinds, including factory buildings, warehouses, storage and machine sheds, dairy and hay barns, stock sheds, drying sheds, grain storage bins, or any building where corrugated metal siding might normally be used. The board should be used with a flat, semi-rigid, waterproof, fire-retardent material as desired. This board has no corrugations, but as its name implies it is laminated, asphalt-saturated felt, covered on one face with colored mineral granules, either buff or dark brown. It requires no painting.—*Certain-teed Products Corp., 120 S. LaSalle St., Chicago, Illinois.*

YOU CAN USE LEAD

for service pipes and calking

No government order now prohibits you from using lead for water service pipe or for calking joints on mains. This is because lead is in sufficient supply so that all military requirements are being met promptly and enough lead remains for many civilian purposes, particularly for such essential industries as water distribution.

Water works which have used lead need not look for a substitute for this time-tested material; others can use lead to solve their critical material problems.

SEAL OF LEAD INDUSTRIES' APPROVAL

Lead pipe and calking lead stamped with the "Seal of Approval" meet the Standards of the Lead Industries Association which are currently identical in substance with those of the National Bureau of Standards. Insist on this Seal on the lead you buy for dependable quality.

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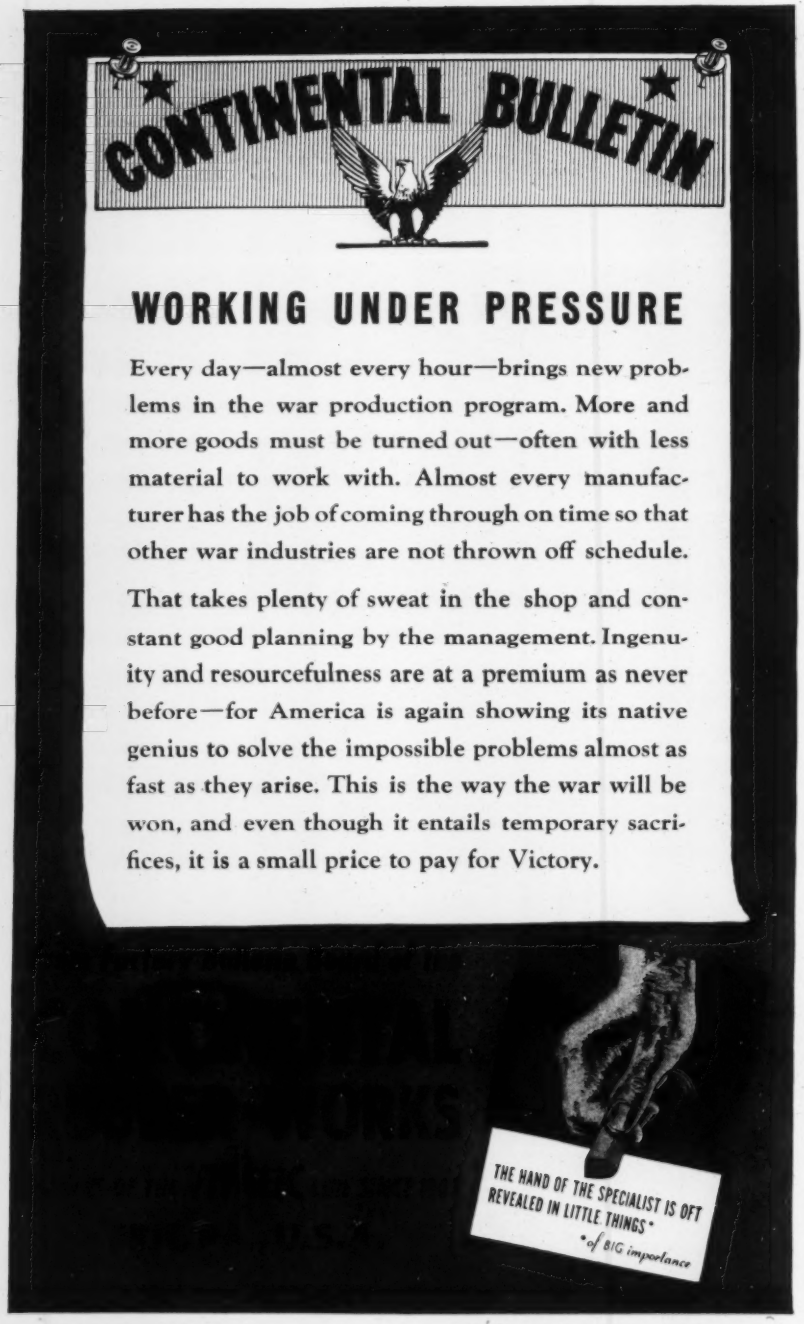
CONTINENTAL BULLETIN
WORKING UNDER PRESSURE
Every day—almost every hour—brings new problems in the war production program. More and more goods must be turned out—often with less material to work with. Almost every manufacturer has the job of coming through on time so that other war industries are not thrown off schedule.
That takes plenty of sweat in the shop and constant good planning by the management. Ingenuity and resourcefulness are at a premium as never before—for America is again showing its native genius to solve the impossible problems almost as fast as they arise. This is the way the war will be won, and even though it entails temporary sacrifices, it is a small price to pay for Victory.
THE HAND OF THE SPECIALIST IS OFT REVEALED IN LITTLE THINGS*
*of BIG importance

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All kinds of Structural Timbers and Lumber Pressure Treated with Creosote Oil or
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Manufacturer Activities

Changes involving its sales organization were announced recently by the JONES & LAUGHLIN STEEL CORP. CLARENCE C. WEHLING (left) has been appointed assistant district sales manager at Pittsburgh, and F. H. DAVIDSON (right) has been appointed assistant manager of sales of the hot rolled sales department. Mr. Wehling started with Jones & Laughlin in 1916, and with the exception of serving in the Marine Corps in World War I, his entire career has been with the company. Mr. Davidson was associated with the company in 1927, and with the hot rolled sales department since 1936. He is a graduate of Ohio State University as a civil engineer.

The CALIFORNIA REDWOOD ASSOCIATION has announced the closing of its New York office, and the office of the DURABLE WOODS INSTITUTE, 155 E. 44th St., New York City. HAL B. ALSTON, who has been director of the Institute since its organization, resigned in March to engage in construction of prefabricated houses for war workers. The sponsoring institutions, therefore, decided to discontinue the work of the Institute for the time being.

Recent personnel additions to keep pace with the growth of the D. W. HAERING organization include the appointment of ARTHUR J. GROTSMA, as controller, and ROBERT SEYL, as the new director of service.

M. E. CLARK, sales manager of RANDALL GRAPHITE PRODUCTS CORP. of Chicago, has been commissioned a major in the Ordnance Corps, U. S. Army.

The UNION WIRE ROPE CORP. of Kansas City, Mo., recently received the Navy "E" award in ceremonies at its Kansas City plant.

The PANAMA CITY SHIPBUILDING DIVISION of J. A. JONES CONSTRUCTION CO., INC., of Charlotte, N. C., has changed its name to the J. A. JONES CONSTRUCTION CO., INC., Wainwright Yard, Panama City, Fla.

The ANDRESEN CORP., of Skokie, Ill., has

BIG NEWS IN THE 90'S

BIGGER NEWS TODAY!

...motor ve... ...owners who are making ...ending
...are the *Cosmopolitan* race should call and examine their tires and
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FROM "HORSELESS AGE" MAY 1896

The Hyatt Roller Bearing

Some years ago John W. Hyatt, the well-known inventor in the celluloid line, undertook an exhaustive series of experiments with the object of producing a practical roller bearing. The result of these experiments was the Hyatt Roller Bearing, which from the time it was first placed on the market has been steadily gaining in favor as its merits as a friction saver become known.

The peculiar feature of the Hyatt bearing is that the rollers are both flexible and elastic, which contributes greatly to its durability and decreases the friction of the bearing. When under a load the pressure is automatically distributed over a number of rollers. On this account it is not necessary to harden the rollers and the surfaces with which they come in contact, as is the case when solid rollers are used.

Wherever thoroughly tested these rollers have fully borne out the claims of the manufacturers. They are being successfully employed in shafting of all kinds, street cars, bicycles, wagons and high speed machinery of all kinds.

Quite a number of motor inventors have adopted them for axle bearings, finding friction greatly reduced.

The Hyatt Roller Bearing Company have a factory in Newark, N. J., at 43d Market Street, and a New York office at 133 Liberty Street, where they will be pleased to see those in search of further information.

HYATTS CERTAINLY HELPED TO MAKE IT THAT WAY!

BUT HOW THESE BEARINGS HAVE IMPROVED IN DESIGN AND CAPACITY OVER 50 YEARS! WHAT A PRECISION BEARING HYATT IS TODAY!

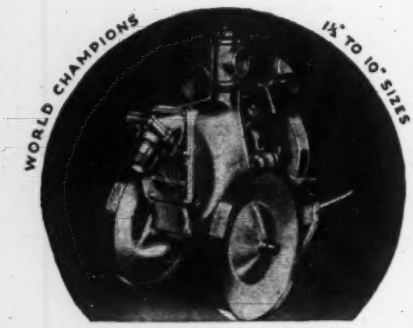
...AND NOW, YOU'LL FIND HYATTS IN CADILLACS, BUICKS, CHEVROLETS, ETC., AS WELL AS IN FARM MACHINERY, INDUSTRIAL APPLICATIONS, AND IN TODAY'S MIGHTY FIGHTING EQUIPMENT.

THIS OFFER STILL GOES! DROP IN... OR DROP A LINE ANY TIME TO...HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION, HARRISON, NEW JERSEY, WHERE FACTORY AND OFFICES ARE NOW LOCATED.

THE 50TH YEAR OF

HYATT ROLLER BEARINGS

1892-1942



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THE STEWART IRON WORKS CO. Inc.
967 Stewart Block, Cincinnati, Ohio

Stewart IRON and WIRE FENCES

announced the addition of four new distributors for the KOTAL product. Distributors are the BADGER SURFACING CO., Oshkosh, Wis.; TRUMAN L. PLATT, Springfield, Ill.; ROCK HILL ASPHALT & CONSTRUCTION CO., St. Louis, Mo.; MERRILL ENGINEERING CO., Jackson, Wis.

JAMES M. HOGHLAND has been appointed sales engineer in the Pacific Coast area for the AMERICAN SCREW CO. of Providence, R. I. Mr. Hoghland will aid K. T. JACKSON, who up to this time has been covering the entire territory. For the present, the new sales engineer will maintain offices at 1724 No. Vista St., Hollywood, Cal.

A school to enable plant and office employees to gain a greater knowledge of instruments, their construction and their use by America's war industries, has been established by WHEELCO INSTRUMENTS CO., Chicago.

JOHN F. BRANDT has been elected president and treasurer of the ANTHRACITE BRIDGE CO. of Scranton, Pa. Other officers elected at a recent meeting were WILLIAM E. HARDING, vice-president, D. BOULTON MUSSER, secretary.

The BURNS & MCDONNELL Engineering Company has closed its Cincinnati office and moved its engineering staff to the Kansas City, Missouri, office at 107 W. Linwood Blvd.

P. P. SOMERVILLE has been appointed to succeed the late Robert Gilmore as general manager of the GILMORE WIRE ROPE division of JONES & LAUGHLIN STEEL CORP. Mr. Somerville joined the company in 1938, supervising installation of equipment in the plant then under construction in Muncy, Pa. He was formerly with the WILLIAMSPORT WIRE ROPE CO.

The CHAIN BELT CO. has announced that the INDUSTRIAL EQUIPMENT CO. of 1301 59th St., Oakland, Calif., has been appointed distributor of Rex construction machinery in the Bay area.

The ROBINS CONVEYING BELT CO. has announced that MAURICE B. BRADLEY, since 1924 in charge of the Cleveland branch office of the organization, is now in active service as a Major in the Coast Artillery, U. S. Army.

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This book is carefully planned to give the information needed by men who actually plan, select, design, and construct civil engineering structures and projects—in one compact volume and at a reasonable price. This second edition blends theory, practice and fundamentals equally; and answers your questions in *any* division of civil engineering.

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Here are the fundamentals of the various subdivisions of civil engineering for the use of practicing engineers confronted with specific problems, particularly those outside their specialized fields. The book offers you ten complete treatises on the ten major subdivisions of civil engineering, each written by a specialist of international reputation in his field.

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NEW PUBLICATIONS

Chemical Feeding—"Corrective Chemical Feeding" is the title of a new 12-page bulletin issued by the American Water Softener Co. The bulletin is more than a catalog listing of equipment, it contains much helpful technical data and a readily detachable information sheet to facilitate requesting of recommendations and quotations.—*American Water Softener Co., Philadelphia, Pa.*

Price Reduction—In accordance with a policy of reducing prices when possible without lowering the quality of its products, the Elastic Stop Nut Corp. announces reductions in prices of 415 items of anchor, gang-channel, and instrument mounting types of elastic stop nuts. The new reduced prices became effective July 1 and will apply to the unshipped portion of all open orders as well as on new orders received on and after July 1.—*Elastic Stop Nut Corp., 2330 Vauxhall Road, Union, N. J.*

Moto-Mixer—A new 1942 Rex Hi-Discharge Moto-Mixer catalog has just been released. The catalog describes the mechanical features of Rex Hi-Discharge Moto-Mixers and Agitators and gives complete specifications and operating data.—*Chain Belt Co., Milwaukee, Wis.*

Control Instruments—Bulletin Z6000, issued recently by Wheelco Instruments Co., contains 16 pages and is a condensed listing of Wheelco's complete line of measuring and control instruments. It describes and illustrates unit construction of temperature controllers, and explains the company's "electronic principle" for effecting control without contact between the measuring and control functions of the instrument.—*Wheelco Instruments Co., Harrison and Peoria Sts., Chicago, Ill.*

Silver Alloy—An article "Silver Alloy Brazing of Fabricated Copper Piping" has just been published by Handy & Harman. It has not appeared in any publication but was printed for the company for distribution to a few industries now particularly interested in this subject.—*Handy & Harman, 82 Fulton St., New York, N. Y.*

War Participation—The Homelite Corp. has issued a well illustrated, well printed loose-leaf bulletin showing the defense uses of its products. The illustrations show many of the fields in which the products are used, and give hints on preservation and use of machinery now in private hands.—*Homelite Corp., Port Chester, N. Y.*

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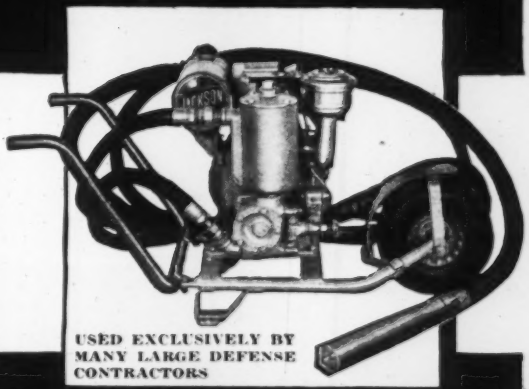
DESIGNED TO "TAKE IT" 3 SHIFTS A DAY — EVERY DAY

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.



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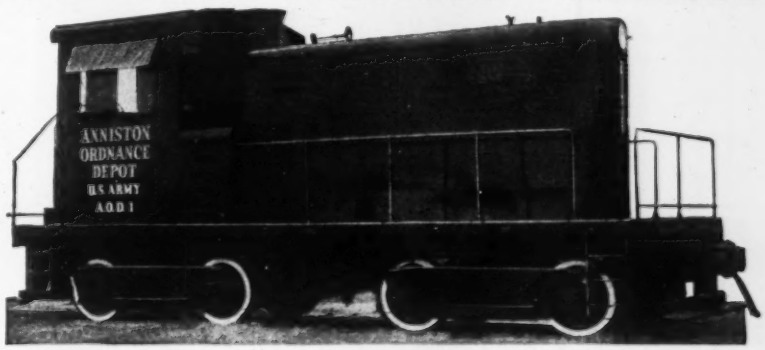
Some Call it "INTESTINAL FORTITUDE"



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Others have a shorter name. Individually and as a nation, Americans can't be licked. No matter how long or tough the going, they'll be in there "pitching" until VICTORY—FREEDOM FOR THE ENTIRE WORLD—has been WON. The ability to do a hard job WELL over long periods is built into every Better-Bilt Davenport we are sending out on scores of vital assignments for our Army, Navy, Our allies, and American builders of war goods and war facilities. Davenport staying power insures splendid performance with more than ordinary FREEDOM FROM REPAIRS. To the many users of Davenport we say "Keep them in Good Condition. We'll cooperate with you to the utmost of our abilities."

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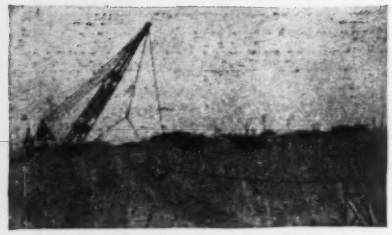

Sauerman Scraper, operated by crane, digs basin 400 ft. wide for reservoir.

MOVE MORE YARDS FASTER FOR LESS MONEY

Where loose materials (such as sand, gravel, blasted rock, ore, etc.) must be dug, hauled, and dumped at ranges from 100 to 1500 ft. the economical way to do it is with a SAUERMAN Scraper or Slackline Cableway.

These efficient machines haul 10 to 1,000 tons of material per hour, require only one operator, and demand little in maintenance. SAUERMAN units have made low cost records on dig-and-haul jobs all over the world for 30 years.

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LONG RANGE MACHINES

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HOW TO *SPEED* CONCRETE WORK

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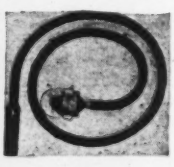
Completely illustrates and describes our new and improved line of Viber Vibrators for gas, electric and air-operation. These are the Vibrators with completely interchangeable parts that are speeding war work everywhere.

• FLEXIBLE PNEUMATIC VIBRATOR

Made in 2⅛" and 3" diameter with 12 ft. and 21 ft. flexible shaft. Complete interchangeability of flexible casings, cores, vibrators. Operates on 80 lbs. pressure.



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MEN AND JOBS

Ralph Weston, of West St. John, N. B., formerly an engineer for the St. John Drydock & Shipbuilding Co., recently was promoted to squadron leader in the Royal Canadian Air Force.

James A. Anderson, Virginia state highway commissioner, has been appointed chairman of the Elizabeth River tunnel commission, which is to plan for construction of a bridge-tunnel project to connect the cities of Norfolk and Portsmouth.

V. W. Enslow has been appointed acting engineer of the Bureau of Bridges for the Missouri State Highway Department.

W. W. Zass, chief engineer for the Arkansas State Highway Dept., has been called to active service as a major in the Corps of Engineers.

M. S. Gwinn, senior engineer in the supplementary roads bureau of the Missouri Highway Department, has been made acting director of a statewide highway planning survey office, replacing **Capt. John H. Long,** recently called to Army service.

P. L. Brockway, Wichita, Kans., engineer, has been reappointed to a four-year term on the state registration and examining board for engineers.

Geo. W. Diebler, of Duluth, Minn., has been renamed county engineer of St. Louis County.

Francis P. Witmer, formerly director of the Department of Civil Engineering at the University of Pennsylvania, has resigned his post and will resume professional practice in New York.

T. J. Smull, recently business manager of Ohio Northern University, has been appointed materials engineer for the State Highway Department.

Max W. Garnett, East Cleveland, Ohio, city engineer, has resigned to enter the Corps of Engineers as a captain.

Elmer L. Ford has been elected a vice-president of the Turner Construction Co. of New York.

Clarence Lamar Burpee, superintendent of the Jacksonville, Fla. terminals district of the Atlantic Coast Line Railroad Co. has joined the Corps of Engineers with the rank of colonel. He will be succeeded at Jacksonville by **W. S. Baker.**

A. W. Herrington, president of Mar-

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DESIGNING, BUILDING and RUNNING SHIPS

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WHATEVER information you need—whether details of ship design, ship materials, hull construction, shipping, ship equipment, ship operation, etc., etc.,—here is just the manual to give you quick, dependable, practical answers to your every question.

HANDBOOK of SHIP CALCULATIONS CONSTRUCTION and OPERATION

By Charles H. Hughes
Naval Architect and Engineer

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HERE is a one-volume reference library on all phases of ship design, construction and operation for naval architects, marine engineers, ship officers and engineers, and shipbuilding draftsmen. Useful, accurate, broad in scope, the book is full of descriptions, handy tables, formulas, pointers and methods related to many varied phases of shipbuilding and shipping. Serves the needs of those who want to prepare for Bureau of Marine Inspection and Navigation examinations.

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Company NR-7-30-42

mon-Herrington Co. of Indianapolis, Ind., has been elected to a three-year term as director of the American Society of Military Engineers.

C. W. Mengel has been appointed project manager for construction of an air base near Durham, N. C.

Maj. Franklin W. Fish, engineer at Camp Beale, Marysville, Calif., has been assigned post engineer at a new training center in Utah.

H. M. Brush, division engineer of the Missouri State Highway Commission at Macon has been promoted to the post of head of the Kansas City division, succeeding **W. H. Burgwin** who recently joined the Corps of Engineers with the rank of major.

Maj. Robert L. Davis, of Baltimore, has been placed in charge of the Milwaukee ordnance plant now under construction.

George H. Thigpen has resigned as testing engineer for the Alabama Highway Department to return to Birmingham as vice president of the Southern Testing Laboratories, Inc.

Roger T. Hall, president of Sweetman & Hall, Inc., Washington, D. C. has been called to active duty as a lieutenant commander in the Navy Civil Engineer Corps.

Charles C. Tripp of Portland, Ore. has been commissioned a first lieutenant in the Corps of Engineers.

Walter A. Burg, Clark County (Ohio) engineer and a first lieutenant in the Army Engineering Reserve Corps, has been called to active service at Fort Belvoir, Va.

Robert N. Wair, of Columbus, former state highway director, has been appointed to the Ohio board of registry for professional engineers and surveyors.

Ellwood Johnson has been appointed engineer of sewers for the District of Columbia.

Lt. J. R. McCoach, Corps of Engineers, has been promoted to first lieutenant.

Capt. A. Tammaro of the Corps of Engineers has been appointed executive officer for the Area Engineer of the Badger Ordnance Works.

S. E. McCullough, of Dallas, Tex., has been appointed general manager for the Navy Division Ordnance plant, Okla. Mr. McCullough was formerly project manager at the Red River Ordnance Depot in Texas.

Louis Krakow, Detroit, has joined the Donley Engineering Co. in Akron, Ohio.

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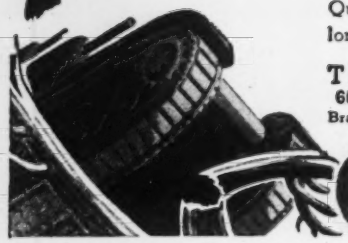

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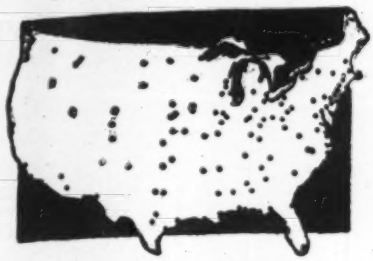
CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily
A-E-M Architect — Engineer-Management type of contract.

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges, Grade Cross'gs
Streets & Roads
Earthwork, Waterways
Unclassified
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

WATER SUPPLY

PROPOSED WORK

Calif., Vallejo—East Bay Municipal Utility Dist., 512 16 St., Oakland, increasing water supply, installing pump, plant near Tank Farm Hill, 12 m.g.c.p.d., addnl. intake piping at Crockett tank, installing 16 in. c.i. pipe from Crockett tank to Carquinez Bridge, installing larger venturi meter at base Pier 5 of bridge. $70,000.

Conn., Bristol—City, Water Dpt., 119 Riverside Ave., watermain exten. $400,000.

†**Ga., Port Wentworth**—Comrs. Chatham Co., water and sewer facilities, Docket Ga. 9-223. $52,000. **FWA.**

Kan., Coffeyville—Plans election to vote bonds, water and power lines. $97,000.

†**Mass., Longmeadow** — Federal Works Agency, 2 Lafayette St., New York, N. Y., water facilities, Docket Mass. 19-168. $50,000.

†**Miss., Flora** — City, water sys. imprvs., pumphouse, pump, deepwell, main. $20,000. **FWA.** CD 5/20—ENR 5/28.

Mont., Dillon—T. F. McFadden, city clk., waterworks sys. exten. $20,000.

N. M., Albuquerque—City, C. Tinley, mayor, WW exten. $300,470. Applied to FWA.

†**N. C., Elizabeth City**—City, WW sys. addns. $86,000. **FWA.**

N. C., Swansboro—Town, water and sewer extens., Project deferred. $126,000.

Pa., Bethlehem—Bethlehem Water Auth., City Hall, addnl. main from Wild Creek Reservoir to plant of Bethlehem Steel Co. $160,000. R. L. Fox, c/o owner, engr.

Pa., Chester—Water supply sys. imprvs. $663,000. Applied for FWA grant.

★†**Utah**—Bureau Reclamation, Denver, Colo., preliminary surveys, plans Dewey Dam and reservoir on Colorado River, southeastern part of state. $15,000,000.

BIDS ASKED

Bids Asked about August 3 to 7

★†**R. I., Portsmouth** and **Middleton**—Federal Works Agency, 18 and F Sts. N.W., Wash., D. C., Contr. 3, water sys., filtration plant, 400,000 gal. reservoir, pump, station, concrete reservoir, Lawton Valley. $865,000. **FWA.** Charles A. Maguire & Associates, 1515 Turks Head Bldg., Providence, engrs. CD 7/16—ENR 7/23.

Bids Asked August 5

Ont., Kingston—Secy. Kingston Pub. Utilities Comn., 1,200 ft. waterworks intake, pump. station substructure. $35,000. CD 4/3—ENR 4/9.

Bids Asked August 10

S. D., Yankton—Anna M. Goetz, city clk., 1 m.g. rein.-con. reservoir. Extended date. CD 7/3—ENR 7/9.

LOW BIDDERS

†**N. H., Portsmouth**—Federal Works Agency, 120 Boylston St., Boston, Mass., July 16, water sys., Contr. 3, pre-stressed concrete standpipe, NH-27-901, from Pressure Concrete Co., 6 Ave. B, Newark, N. J., **$16,745.** CD 7/7—ENR 7/9.

†**Texas**—U. S. Eng., Fort Sam Houston, July 21, water supply and distr. sys., gas distr. sys. and sanitary sewerage sys., Spec. 42-204, from Trueheart & Caldwell & Lee, 608 Builders Exch. Bldg., San Antonio. CD 7/17.

†**Tex., Bay City**—S. E. Doughtie, mayor, July 17, WW imprvs., Tex. 41-418, from Tellepsen Constr. Co., 3900 Clay St., Houston, **$134,928. FWA.** CD 7/7—ENR 7/9.

Wash., Bremerton—E. J. McCall, city clk., City Hall, July 15, 24 in. supply line between head of Sinclair inlet and 1 and Wycoff Sts., and connecting line on County Road 154, from Valley Constr. Co., 4354 Henderson St., Seattle. **$258,874.**

CONTRACTS AWARDED

†**Arizona**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., deep well turbine pump, to Food Mchy. Corp., Phoenix. Est. less than **$50,000.**

†**Arizona**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., water transmission line, No. 573, to The Lang Co., 5501 Santa Fe Ave., Los Angeles, Calif. Est. over **$15,000.** Bids 7/23.

†**Arizona**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., water well drilling, Pima Co., to Roscoe Moss Co., 4360 Worth St., Los Angeles, Calif., under **$50,000.**

†**Arkansas**—U. S. Eng., Postoffice & Courthouse, Vicksburg., Miss., waterworks, sewerage sys., to Volz Constr. Co., Ripley, Tenn. M. L. Crist, 319 Brown St., Little Rock, engr.

★†**Arkansas**—U. S. Eng., Gay Bldg., Little Rock, water and sewer facilities, Jackson Co., to B and B Constr. Co., Wichita Falls, Tex., **$100,000-$500,000.**

†**Arkansas**—U. S. Eng., P. O. Box 97, Memphis, Tenn., well drilling, Mississippi Co., to Leslie Carloss, Carloss Well Supply Co., Concord Ave. at N. 2 St., Memphis, Tenn., under **$50,000.**

★†**Arkansas**—U. S. Eng., Courthouse & Postoffice, Vicksburg, Miss., water distr. and sanitary sewer sys., to Volz Constr. Co., Ripley, Tenn. Est. **$100,000-$500,000.**

California — East Bay Municipal Utility Dist., 516 16 St., Oakland, 19,860 lin. ft. 2- to 8-in. c.i. watermains, Alameda and Contra Costa Counties, to Underground Constr. Co., 354 Hobart St., Oakland, Schedules 2 and 3. **$15,524.** Bids 7/22, awarded 7/22. CD 7/16.

†**Colorado**—U. S. Eng., c/o Postmaster, Denver, well pump houses, to A. C. Larsen, 2471 Arapahoe St., Denver.

Colo., Colorado Springs—32,500 ft. water line, to Louis Pinello, RFD 1, Colorado Springs, **$22,174.** F. O. Ray, Colorado Springs, engr.

†**Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, water distr. and sewage collection sys., Alachua Co., to I. H. Smith, 1525 San Marco Blvd., Jacksonville, **$50,000-$100,000.**

★†**Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, water distr. and sewage collection sys., Dade Co., to W. T. Price Dredging Co., 3200 S.W. 27 Ave., Miami, **$100,000-$500,000.**

★†**Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, water supply and sewage treatment sys., Lee Co., to R. E. Clarson, Inc., St. Petersburg, **$100,000-$500,000.**

★†**Georgia**—U. S. Eng., Courthouse & Postoffice, Jacksonville, water and sewerage sys., Inv.-Neg-Jax-43-39, to Wainer Const. Co., Valdosta, less than **$1,000,000.** Awarded 7/15.

†**Ill., Decatur** — Water lines, own forces. **$30,847.** War Dpt. will finance.

†**Kansas**—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., test wells, pump. stations, to F. H. Kelley Drilling Contractor, Ashland. Est. under **$50,000.**

†**Mississippi**—U. S. Eng., Courthouse, Vicksburg, water supply walls, to C. M. Journey Co., Greenwood. Est. less than **$50,000.**

†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, water and sewer lines, Douglas Co., to Central Plumbing Co., and National Constr. Co., 1335 S. 20 St., Omaha, under **$50,000.**

★†**Nebraska**—U. S. Eng., 1709 Jackson St., Omaha, water distr. and sanitary sys., Cheyenne Co., to Inland Constr. Co., 3867 Leavenworth St., Omaha. **$100,000-$500,000.**

Neb., Falls City—Skelly Oil Co., Falls City, water disposal sys. for 12 producing oil wells, own forces. **$20,000.**

Neb., Omaha—Metropolitan Utilities Dist., 18 and Harney Sts., imprvs. at WW plant, intake construction, Sect. 1, test holes and grouting, to Layne-Western Co., World Herald Bldg.***Sect. 2, booster pump, to Pomona Pump Co., Pomona, Calif.***Sect. 3, underpinning south intake, to Condon & Cunningham Co., Grain Exchange Bldg. Total est. **$150,000.**

†**Nevada**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., drilling water well, Clark Co., to E. W. Brockman, 918 W. 6 St., Corona, Calif., under **$50,000.**

New Jersey—Industrial Company, 1 story, 24x26 ft., brick pumphouse, 24x56 ft. spray pond and open reservoirs, 24x84 ft. suction well, to Mahony-Troast Const. Co., 657 Main St. Albert Kahn Associate Archts. and Engrs., 345 New Center Bldg., Detroit, Mich., archt.

†**New York**—U. S. Eng., 120 Wall St., New York, addnl. water supply facilities, Nassau Co., to Karlson & Reed, Inc., W. Barclay St., Hicksville, under **$50,000.**

Okla., Choteau — Waterworks, distr. sys., to O. M. Drake, Muskogee. **$96,800.** Est. $100,000. Awarded 7/18. T. P. Clonts, Muskogee, engr.

Okla., Enid—28,000 lin. ft. 12 in. c.i. water pipeline, to Asplund Const. Co., 7 and Oak Sts. **$95,393.** Est. $110,000. Awarded 7/16. CD 5/20—ENR 5/28.

†**Okla., Enid**—C. L. Walker, mayor, Contr. 3, addns. imprvs. water sys., Okla. 34-124, to Asplund Const. Co., Enid, **$126,993. FWA.** Bids 7/14. CD 7/2—ENR 7/9.

†**Okla., Lawton**—W. B. Hendrick, engr., City Hall, Contr. 2, filtration plant, Okla., 34-119, to Lippert Bros. Const. Co., Sparta, Wis., **$102,183.** Est. $110,000. **FWA.** Bids 6/9. CD 5/28—ENR 12/11.

★†**Pennsylvania**—U. S. Eng., Standard Oil Bldg., Baltimore, Md., water supply sys., to The Marshall Co., Dover, O. **$100,000-$500,000.**

†**South Carolina**—U. S. Eng., 33 Customhouse, Charleston, water distr. storage and pump. sys., to C. Y. Thomason Co., Greenwood. Est. **$50,000-$100,000.**

†**Texas**—U. S. Eng., Denison, water softening plant, to Panhandle-Sira-Dalton Co., 3901 Elm St., Dallas. Est. **$50,000-$100,000.**

†**Utah, Layton**—City, complete waterworks sys., Utah 42-101, to Enoch Smith Sons Co., 737 E. 2 St., Salt Lake City, **$64,829. FWA.** CD 4/23—ENR 4/23.

†**West Virginia**—U. S. Eng., Chesapeake & Ohio Bldg., Huntington, water wells, to R. G. Morrison, Kaylong, under **$50,000.**

Wash., Seattle—Bd. P. Wks., County-City Bldg., watermains, 46 Ave. N.E., to Argentieri & Colarossi, 1819 Weller St. **$15,144.** Bids 7/2. C. L. Wartelle, County-City Bldg., engr.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Calif., San Diego—3,000 ft. 36 in. rein. con. storm drain from Rosecranz Blvd. and Midway to Rosecranz and Santa Fe tracts. E. E. Wallace, State Hy. Bldg., div. engr.

†**Mass., East Longmeadow**—Federal Works Agency, 2 Lafayette St., New York, N. Y., sewer facilities, Docket Mass. 19-169, $50,000, and Docket Mass. 19-170, $14,260.

N. J., Little Falls—Vitr. tile sewer, Jackson Park. $25,000. R. Gray, twp. engr.

SEWERS, etc. (Proposed Work, Cont'd.)

N. Y., Olean—City Council, City Hall, repairs, rebuilding sewers, water lines, washed out by flood. Over $45,000. C. H. Weatherell, city engr.

O., Alliance—Altering sewage plant. Over $25,000. Blum, Weldin & Co., Bakewell Bldg., Pittsburgh, Pa. and Chester Engineering Co., 210 E. Park Way, Pittsburgh, Pa., engrs.

Ore., Corvallis—Sewage treatment plant, interceptor sewer. $300,000. V. Goodnight, Corvallis, engr.

†Wash., Seattle—Sewer Dist. 4, sewers to serve White Center Dist., south of here, with submerged outlet in Puget Sound, Docket 45-222. $300,000. **FWA.** Parker & Hill, Smith Tower, engrs.

Wis., La Crosse—48 in. trunk storm sewer, Wall St. J. H. Barth, city engr.

BIDS ASKED

Bids Asked August 5

†Md., Hyattsville — Washington Suburban Sanitary Comn., Hamilton St., Contr. 157-S, vitr. sewers. H. R. Hall, ch. engr.

Bids Asked August 6

†Wash., Edgerton — Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., subdrainage sys., etc.

Bids Asked August 12

†La., New Orleans—Sewerage & Water Bd., sewer extens., La 16-109. $69,215. **FWA.** CD 7/8—ENR 7/11.

LOW BIDDERS

†Ind., Charlestown—Town, E. H. Orman, chn., July 20, sewage treatment plant, from A. J. Jelen & Sons, Box 353, Rural Route 7, Cincinnati, O. **$85,200.** Est. $110,000. **FWA.** CD 7/13.

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, 2 incinerators, from J. A. Harper, Crowville.

Md., Towson—Comrs. Baltimore Co., Towson, Item 1, Contr. 62-S, sanitary sewers in vicinity of North Point and German Hill Rds., Gray Manor, from I. Capaldi & Sons, 6113 O'Donnell St., Baltimore. **$62,472.** Bids 7/20. CD 7/8—ENR 7/18.

★**†Texas**—U. S. Eng., Fort Sam Houston, sewage facilities and water supply, distr. sys., from Yarbrough & Reinhardt, Austin, **$100,000-$500,000;** natural gas distr. sys. and constructing streets, concrete paving, from Drummond & Yeates, Abilene, **$100,000-$500,000.** All Spec. 42-150.

†Texas—U. S. Eng., Fort Sam Houston, July 18, sewage treatment plant imprvs., Spec. 42-159, from R. H. Folmer, P. O. Box 671, Austin. CD 7/13.

†Tex., Bay City—City, c/o S. E. Doughtie, mayor, July 17, sewerage sys. exten., Tex. 41-414, from H. Nodland, Bastrop. **$129,890.** Est. $107,000. **FWA.** CD 7/7—ENR 7/9.

Tex., Houston—Harris Co., c/o Judge, June 6, storm sewers along Buffalo Speedway, Sect. 2, from West University Place, City of West University Place. **$26,282.** CD 6/5.

CONTRACTS AWARDED

†Arizona—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., sewer and water lines, No. 114, to Fisher Contg. Co., Box 4035, Phoenix. Bids 7/17.

†California—U. S. Eng., 751 S. Figueroa St., Los Angeles, incinerator, to Smith Engineering Co., 832 W. 5 St., Los Angeles. Est. under **$50,000.**

Conn., Stratford—Supt. P. Wks., Town Hall, storm and sanitary sewers Mercer St., Glenwood, Rosedale, Fairview and Varrace Aves., own forces. **$25,000.** M. Jankowski, Town Hall, engr.

★**†Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, sewage collection and water distr. sys., Inv. Neg.-Jax-43-19, to Paul Smith Const. Co., 3301 N. Miami Ave., Miami, less than **$1,000,000.** Awarded 7/12.

★**†Kansas**—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., sewage disposal plant, to Ottinger Bros., Petroleum Bldg., Oklahoma City, Okla., **$100,000-$500,000;** electrical distr. sys., to Galey & Malloy, Tahlequah, Okla., under **$50,000.**

★**†Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, sanitary sewerage and water supply sys., to Chris Nelsen Co., Royal Oak, less than **$1,000,000.**

†Nebraska—U. S. Eng., 1709 Jackson St., Omaha, sewerage, water lines, Sarpy Co., to Bradley-Dodson-Sterling, Omaha, **$50,000-$100,000.**

N. J., East Orange—Town, Town Hall, sheeting, sewers. **WPA. $60,500.** C. Malstrom, Orange and N. 6 Sts., Newark, WPA engr. CD 7/7—ENR 7/9.

N. J., Westfield—Rein.-con. storm sewers to Guy Villa & Sons, 995 Central Ave., **$32,139.** A. Hopkins, 121 Prospect Sr., engr.

★**†New Mexico**—U. S. Eng., Albuquerque, sewage disposal plant, to K. L. House Constr. Co., Albuquerque. Est. **$100,000-$500,000.**

†N. Y., Mattydale—North Syracuse Sanitary Dist., at offices Onondaga Co. Comrs., Syracuse, portion trunk sewer line, Docket N.Y. 30-198, to Paino Constr. Corp., 1835 E. 14 St., Brooklyn. **$137,888. FWA.** Bids 7/20. CD 4/29—ENR 3/26.

†Texas—U. S. Eng., San Antonio, sewage treatment plant, to R. E. Ewing, Corpus Christi. Est. **$50,000-$100,000.**

Tex., Houston — Harris Co., c/o Judge, storm sewers, Bissonnett St. and Buffalo Speedway, to W. A. McClendon, 4617 Walker St. **$29,736.** W. H. Zapp, Courthouse, co. engr. CD 6/5.

Ont., Brantford—Dpt. National Defense for Air., Ottawa, sewers, sewage disposal plant, roads, walks, etc., at S.F.T. School and Wireless School, Burford Rd., to Keystone Contractors, Ltd., 732 Langlois Ave., Windsor, **$57,000.**

Ont., Welland—J. D. Watt, municipality clk., storm sewer, to Scott-Jackson Constr. Ltd., 57 Bloor St., Toronto. **$27,578.** CD 6/2—ENR 6/4.

BRIDGES GRADE CROSSINGS

PROPOSED WORK

Ill., Bluford—Illinois Central R.R., 12 St. and Michigan Ave., Chicago, C. H. Mottier, ch. engr., relocating crossing with South Ave. to Short St.

Ill., Danville—Vermilion Co., 3 rein-con. bridges, double box culvert on S.A. Route 8, west of Catlin, $34,000; 3 rein.-con. bridges S.A. Route 23, east of Georgetown, $42,000, steel I-beam bridge on S.A. Route 14, west of Rossville, $80,000; rein-con. girder bridge on S.A. Route 11 near Armstrong, $40,000; 2 rein.-con. bridges, double box culvert on S.A. Route 8, $38,000; rein.-con. girder bridge on S.A. Route 18, north of Sidell, $55,000. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets.

Me., Bath—State Hy. Comm., Augusta, underpass and 1,900 ft. approaches to connect with Carlton Bridge. $410,000.

★**Minnesota** and **Wisconsin**—State Hy. Dpt., St. Paul, Minn., and State Hy. Dpt., Madison, Wis., interstate bridge over St. Croix River between Minnesota and Hudson, Wis. Over $500,000.

†Tennessee—Tennessee Valley Auth., Knoxvill, 60 ft. wide, concrete, steel, wood and concrete bridge in Fort Loudon Area, behind University of Tennessee Campus.

†Wash., Bremerton—State Hy. Dept., Olympia, untreated wooden piling dolphins, driven into floor of Puget Sound, 45 ft. below water level to protect piers of Manette bridge, Docket 45-146. $10,000. **FWA.** B. Bantz, Olympia, state hy. dir.

BIDS ASKED

Bids Asked August 4

Maryland—State Roads Comn., Baltimore, 49 ft. span steel I-beam bridge, concrete substructure to provide addnl. underpass for Penn R. R. tracks, North Point Rd., Contr. BC 169-766.

Bids Asked August 5

Kansas — State Hy. Dpt., Washington, bridge berm repairs and erosion control, K 2363-Br. 3.1; K 2362, Br. Sta. 42-15, both Washington Co.; K 2360, Br. Sta. 42-55, Republic Co.; addn. to concrete riprap K 2364, Br. 26.2, Washington Co. R. C. Keeling, Topeka, engr.

Bids Asked August 7

★**Pennsylvania**—State Hy. Dpt., I. L. Hughes, secy., Harrisburg, 5 concrete structures, grading, drainage, concrete paving, bituminous surface for paving railroad crossing, 2 timber deck I-beam, 1 rein.-con. deck I-beam and concrete abutments for steel stringer bridge, 19,702 ft. Legislative Route 170, Sect. 17, Traffic Route 309, Wilkes-Barre and Hanover Twps., Ashley Boro, city of Wilkes-Barre, Luzerne Co., over $500,000; 292 ft. plate girder bridge, concrete paving Legislative Route 335, Sect. 3, Traffic Route 590, Salen Twp., Wayne Co., over $25,000. T. C. Frame, ch. engr.

Bids Asked August 12

La., Thibodaux — Police Jury Lafourche Parish, wood pontoon bridge over Bayou La Fourche, St. Charles Church, 7 mi. above here; pile trestle bridge over Yankee Canal, opposite Golden Meadow roadway on present steel bridge over Bayou Lafourche, 4 mi. above here, fronting Laurel Grove plantation.

Ontario—R. M. Smith, deputy minister Dept. Hys., Toronto, bridge over Departure Creek, $30,000.

Bids Asked August 11

Pa., Rankin—Bd. Comrs. Allegheny Co., R. G. Woodside, controller, Pittsburgh, general repairs superstructure Rankin Bridge 7, Proj. A-N1-7. $150,000. Levi Burd Duff, County Office Bldg., Pittsburgh, engr. CD 6/15—ENR 6/18.

Bids Asked August 18

La., Franklin—Police Jury, St. Mary Parish, driving 6,600 lin. ft. piling for bridge, near Katy Plantation. Plans deposit $50.

LOW BIDDERS

California—State Div. Hys., Sacramento, July 22, repairing bridge, etc., Sacramento Co., from M. A. Jenkins, 3560 Bway., Sacramento, **$29,481.** CD 7/3—ENR 7/9.

California—State Hy. Dept., 808 State Bldg., Los Angeles, July 23, timber steel (salvage) bridge across [illegible] No. XI-SD-Harbor Drive, city San Diego Co., from R. A. Bell [illegible] **499.** CD 7/3—ENR 7/9.

Michigan—State Hy. Dpt., [illegible] 15, 8 span, rein.-con. grade [illegible] 6 span, rein.-con. grade [illegible] Wayne Co., from L. A. David [illegible] Joseph St., Lansing. **$253,13[illegible]** respectively. CD 7/9.

N. J., Elizabeth—Union Co., [illegible] tering bridge, new concrete [illegible] over Elizabeth River, S. [illegible] Contg. Co. of Westfield, State [illegible] tainside, **$30,842.**

CONTRACTS AWARDED

†Colorado—U. S. Eng., c/o Postmaster, Denver, treated timber bridges, to Colorado Bridge & Const. Co., 2354 Kearney St., Denver.

N. J., Eagleswood—Ocean Co., Toms River, Stafford Forge bridge and spillways of Westcunk Creek, to A. Cranmer, Marietta, over **$25,000.** H. G. Shinn, 640 Ocean Ave., Lakewood, engr.

Ore., Astoria—Clatsop Co., County House, repairing bridges, own forces. $60,000. A. F. Danielson, Warrenton, co. engr.

New Brunswick — Dpt. P. Wks., Fredericton, 100 ft. rein.-con. arch, New River Mills bridge between St. George and St. John, to J. D. and W. A. McVay, St. Stephen, approx. **$30,000.** C. A. MacVey, c/o Dpt. P. Wks., engr.

STREETS AND ROADS

BIDS ASKED

Bids Asked August 3

New Jersey—S. Miller, Jr., comr. State Hy. Comn., Trenton, grading, concrete on penetration macadam paving 2.21 mi. Route 38, Sects. 1C and 2A, from Bordentown to Mansfield Sq., FAP SN-FAP-100 F(1). Burlington Co.

Bids Asked August 4

Ill., Chicago—Cook Co., grading, crushed stone base course 2.5798 mi. Sect. 229-6[illegible] 15 d; 1.4070 mi. Sect. 23400304-15 d; 0.[illegible] mi. Sect. 181-0101.1 and 230-10101-15 d; 3.7305 mi. Sect. 227-0202-15 d; 2.37597 mi. Sect. 014-0306-15 d; 2.4987 mi. Sect. 132-0[illegible] 15 d; 1.4691 mi. Sect. 222-0305-15 d; 1.4[illegible] mi. Sect. 081-0304 and 108-0303-15 d; 0.[illegible] mi. Sect. 109-0102-15 d; 2.3049 mi. Sect. 2[illegible] 0103.1-15 d; 0.8941 mi. Sect. 262-0302-15 d; 2.435 mi. Sect. 126-0103.1-15 d; 1.811 mi. Sect. 082-0607-15 d. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets.

Ill., Chicago—Dpt. P. Wks., O. E. Hewitt, comr., concrete paving S. Jefferson St., W. Roosevelt Rd. to W. Harrison St.

Ill., Rushville—Schuyler Co., grading, draining 2.8572 mi. Sect. 7A-MFT. G. H. Baker, Centennial Bldg., Springfield, state engr. Co. roads and city streets.

Indiana—State Hy. Comn., S. G. Hadden, chn., Indianapolis, bituminous resurfacing 3.45 mi. Fort Wayne Hy. Dist., Contr. M-2315, Allen Co.; 9.16 mi. same road, Contr. M-2314; 2.07 mi. Contr. M-2313, foregoing Allen Co.; 10.54 mi. Crawfordsville Hy. Dist., Contr. M-2308, Clinton Co.; 7.5 mi. same hy., Contr. M-2307, Hendricks and Putnam Counties; 5.9 mi. same hy., Contr. M-2306, Vigo Co.; 4.53 mi. Greenfield Hy. Dist., Contr. M-2316, Jay Co.; 13.89 mi. Seymour Hy. Dist., Contr. M-2317, Ripley and Dearborn Counties; 9.65 mi. same hy., Contr. M-2318, Crawford and Harrison Counties; bituminous widening 15.04 mi. Laporte Hy. Dist., Contr. M-2311, Starke and Laporte Counties; bituminous widening and resurfacing 5.45 mi. same hy., Contr. M-2310, Starke Co.; 7.87 mi. same hy., Contr. M-2309, Pulaski Co.; 7.61 mi. Vincennes Hy. Dist., Contr. M-2319, Spencer and Dubois Counties; bituminous retread surface or concrete paving 1.786 mi. hy. near Burns City, Martin Co. (readv.); mulched seeding 4.7 mi. Rd. 165, Gibson Co.; bituminous surfacing, concrete base, removing street car rails, 1.2 mi. Laporte Hy. Dist., Contr. M-2312, Lake Co. R. Bower, c/o State Hy. Comn., ch. engr.

Maryland—State Roads Comn., Baltimore, grading, draining, gravel surfacing 6.17 mi. Three Notch Rd., St. Marys Co., Contr. S.M. 255-566; 6.429 mi. same road, Contr. S.M. 253-566.

Minn., Faribault—C. L. McCarthy, aud. Rice Co., clearing, grading, etc., State Id Rd. 5, Webster Twp; County Aid Rd. 75, Wells Twp. A. R. Taubman, co. hy. engr.

N. J., Bloomfield—Essex Co., Hall of Records, Newark, plain concrete paving, curbing, New East Passaic Ave. from Pilch Rd. to New Watchung Ave. W. Stickel, Hall of Records, Newark, engr.

★**Ohio**—State Hy. Dpt., Columbus, grading, drainage structures, roadside imprvs., concrete or concrete and brick wearing course paving 1.144 mi. Sects. A and Canton of SH 992, Stark Co., $165,000 or $206,300 respectively; grading, drainage structures, replacing portions existing pavement with concrete 7.878 mi. Sects. C and D or SH 7, U.S. 52, Adams Co., $64,300; applying aggregate treatment 10.14 mi. Sects. D, E and F of SH 941, Ashland and

STREETS etc. (Bids Asked, Cont'd.)

Richland Counties, $29,695; grading, building concrete slab bridge, with concrete abutments, removing, replacing concrete wearing course on another bridge, concrete paving, roadside impry. 5.181 mi. Sects. G, N, N-1 N-2, O and P of SH 23; Lorain and Medina Counties, $449,109; grading, concrete paving, brick surface course 6.765 mi. Sects. Toledo and A of SH 909, Lucas Co. $101,500; drainage structures, surface treated waterbound macadam widening, 4.708 mi. Sects. Canton and Massillon of SH 68, U.S. 30, Stark Co. $73,420.

†**Virginia**—Pub. Roads Admin., Winder Bldg., 17 and F Sts. N.W., Wash., D. C., access road, VA-DB-WR-14, Arlington Co.

Bids Asked August 5

Kansas—State Hy. Dpt., Washington, light type surfacing 10 mi. K2089, Geary Co. R. C. Keeling, Topeka, engr.

West Virginia—State Road Comn., Charleston, surface treating and penetration macadam surfacing 6.1 mi. Tyler Co. line-Piggin Run Rd., SP 2197, and 6.3 mi. Meathouse Fork-Town Camp Run Rd., SP 3404A and (Pt.), Doddridge Co.; surface treating 4.2 mi. Ramage-Logan Co. line Rd., SP 296-A, Boone Co.; 4.1 mi. Sutton-Flatwood Rd., SP 69 and 159-A, Braxton Co.; 3.7 mi. Grantsville-Russett Secondary Rd., SP 5014, Calhoun Co.; 12 mi. Baker-Wardensville Rd., SP 3442-A and B, Hardy Co.; 1.5 mi. Woff Summit-toward U.S. 19 Secondary Rd., SP 6328, and 2.3 mi. U.S. 50, toward Jarvisville Secondary Rd., SP 5207, Harrison Co.; 6.1 mi. Cross-Lanes-U.S. 35 at Big Tyler Secondary Rd., SP 6313, Kanawha Co.; 5.6 mi. Pecks Mill-Lake Secondary Rd., SP 5600, Logan Co.; 12.6 mi. Moundsville via Fork Rd., to U.S. 250 Secondary Rd., SP 5377, Marshall Co.; 7.7 mi. of end of FAS 57-A, near Montcalm, via McComas to Giatto Secondary Rd., SP 5304 and 4 mi. Green Valley-Bluefield Secondary Rd., SP 6357, Mercer Co.; 3.9 mi. Virginia State via Sweet Springs to Virginia State line Rd., SP 3409, Monroe Co.; 3.3 mi. Paw Paw-Hampshire County line Rd., SP 3360, Morgan Co.; 2.8 mi. Roderfield-Hensley Branch Secondary Rd., SP 5932, and 4.4 mi. Gary-Filbert Secondary Rd., SP 5274, McDowell Co.; 9.5 mi. Top Powells Mountain-Braxton Co. line Rd., SP 159-C, Nicholas Co.; 3 mi. Virginia State line toward Bartow Rd., SP 3426 (Pt.), Pocahontas Co.; 5.1 mi. Shady Springs-Summers Co. line Rd., SP 3052, Raleigh Co.; 4 mi. Cotton toward Amma Secondary Rd., SP 5467, Roane Co.; 13.7 mi. Davis-Randolph Co. line Rd., SP 3454 and 3518, Tucker Co.; 3.6 mi. U. S. 52 via Wilson Creek-Boaton Secondary Rd., SP 5797, Wayne Co.; 2.7 mi. Pineville-Ritter Mine Secondary Rd., SP 5239, Wyoming Co.

Bids Asked August 6

New Mexico—B. G. Dwyre, engr. State Hy. Dpt., Santa Fe, base course, double penetration wearing top 18.296 mi. Colfax Co., $250,000; 12.858 mi. San Miguel Co., $130,000.

Wash., Seattle—Removing street railway tracks, repairing, restoration 1 Ave. and 1 Ave. S. between Denny Way and Atlantic St. $100,000. C. L. Wartelle, County-City bldg., engr.

Bids Asked August 7

Ind., Jeffersonville — Jeffersonville Flood Control Bd., Jeffersonville, blacktop paving 2 mi. roadway along top of new flood control levee, from here to Clarksville. $45,000. J. Bruner, Jeffersonville, engr.

Minnesota—State Hy. Dpt., St. Paul, gravel surfacing 12.8 mi. S.P. 0901-26, Divs. A, B and C, (Trunk Hy. 23-185), S.P. 0901-24 (TH 23-185) and S.P. 0901-27 (TH 23-185), SN-A-FAP 520 C(4), 52-A(2), 520 B(2), and 520 F(2); grading, graveling, bituminous material surfacing 2.9 mi. S.P. 2801-10 (TH -16-9), and S.P. 2805-25A and B (TH 61-3), SN-A-FAP 147 (6) and 371 A(5) La Crescent; gravel surfacing, binder soil 10.3 mi. S.P. 1106-13 (TH 34-34); sand gravel fill and Bridge 6458, 2 mi. S.P. 6927-02 (TH 73-163); topsoiling, concrete paving 0.1 mi. S.P. 8503-07 (TH 43-75) FAP 912 A(5). J. T. Ellison, state hy. ch. engr.

★**Pennsylvania** — State Hy. Dpt., I. L. Hughes, secy., Harrisburg, concrete paving, 2 plain concrete structures, bituminous on native stone or crushed aggregate surfacing, rein.-con. structure 39,550 ft. Legislative Route 43, Sect. 1, Traffic Route 30, Franklin Twp., Adams Co., over $500,000; concrete paving, bituminous on native stone or crushed aggregate surfacing 20,272 ft. Legislative Route 252, Sect. 3, Traffic Route 132, Bucks Co., over $25,000; concrete paving, rein.-con. bridge over Springbrook Creek, Moosic Boro, 950 ft. Legislative Route 439, Sect. 5, Traffic Route 502, Lackawanna Co., over $25,000; cement retaining wall, 280 ft. Legislative Route 4, Sect. 14A, Traffic Route 11, Luzerne Co., over $25,000; concrete paving 3,989 ft. divided hy., Legislative Route 67012, Sect. 1, city of Phila., Philadelphia Co., over $25,000; grading, drainage, concrete paving 4,808 ft. Legislative Routes 67054, Sects. 3 and 67043, Essington and Passyunk Aves., Phila., Philadelphia Co., over $25,000; bituminous on crushed aggregate base course, concrete paving 6,844 ft. divided hy., Legislative Route 67054, Sects. 1-A and 2-A, Phila., Philadelphia Co., over $25,000. T. C. Frame, ch. engr.

Bids Asked August 14

Minnesota—State Hy. Dpt., St. Paul, grading, soil and gravel surfacing 5.2 mi. S.P. 8710-08, TH 75-6, SN-A-FAP 445 A (4). Plans deposit 90c.; 0.1 mi. S.P. 1918-11, TH 100-117. Plans deposit 70c. J. T. Ellison, ch. engr.

Bids Asked August 18

La., Baton Rouge—East Baton Rouge Parish Police Jury, Courthouse, 3 course hot asphalt penetration top paving Steel Pl. and Zeeland Pl. subdivision and being Cleon Ave. from Broussard St. to Hundred Oaks Ave. (6th Ward E.B.R.); University Garden subdivision, being Morning Glory Ave., 6 Ward; Zee Zee Gardens subdivision, being Fiero St., 6 Ward; Midway Pl., Rosalie Park subdivision, being Winnbourne St. (McCalop Rd.), 3 Ward; Suburb Istrouma and Suburb Prosperity subdivision, and being Pontiac St., all East Baton Rouge.

Bids Asked

Illinois—State Dpt. P. Wks., Div. Hys., Springfield, rejected bids June 12, imprv. hys. Dist. 4, Patch 12, SBI Rte. 28, Henry, Knox and Bureau Counties; Sects. 28 R and 29 R, SBI 9, Dist. 4, Hancock Co. CD 6/16—ENR 6/18, under LB.

Kentucky—State Dpt. Hys., Frankfort, rejected bids July 17, imprv. hys., MP 56-18-A, MP 56-58-A, MP 56-118-B, all Jefferson Co., MP 93-196-A, Oldham Co. CD 6/25—ENR 7/2; 3.542 mi. Laurel Co., CD 7/21—ENR 7/23, under LB.

Louisiana—Dpt. Hys., Baton Rouge, received no bids July 22, imprv. Houma-Raceland Hy., Terrebone Parish; rein.-con. box culvert, approaches, Jefferson Davis Parish. CD 7/7—ENR 7/9.

Nevada—State Dpt. Hys., Carson City, received no bids July 23, imprv. 6 mi. Eureka Co. CD 7/14.

†**Texas**—U. S. Eng., Fort Sam Houston, constructing and paving streets, Spec. 42-225. $35,000. Plans deposit $25.

LOW BIDDERS

★**California**—State Div. Hys., Sacramento, July 22, imprv. 11.5 mi. Humboldt Co., from John Carlin Constr. Co., P. O. Box 879, Redding, **$327,827**; 5.9 mi. Kern Co., from Griffith Co., 502 Los Angeles Ry. Bldg., Los Angeles, **$384,952**. CD 7/17 and 7/3—ENR 7/9 respectively.

Connecticut—State Hy. Dpt., Hartford July 22, imprv. 12,767 ft. hy. Groton, from A. I. Savin Constr. Co., 10 Village St., East Hartford, **$412,023**. CD 7/16.

★**Florida**—State Rd. Dpt., Tallahassie, surfacing 3 mi. Rd. 341, Escanaba and Santa Rosa Counties, from Noonan Const. Co., Pensacola, **$59,045**; paving 41 mi. cut-off Over-seas hy. between Key West and Florida mainland, Monroe Co. and 19 mi. same hy. between Jewfish creek and Florida City, Dade Co., from Belcher Oil Co., 1217 Biscayne Blvd., Miami, **$1,373,603** and **$583,735** respectively.

Ill., Charleston—Coles Co., July 7, imprv. 1.029 mi. Sect. 7-MFT, from Walker Constr. Co., 421 S. 21 St., Mattoon, **$42,224**; 1.0227 mi. Sect. 11-NFT, from Thornton & Sons, 2205 Bway., Mattoon, **$46,925**. CD 6/30—ENR 7/2.

Ill., Chicago—Cook Co., 535 County Bldg., July 1, tar concrete surfacing 2.425 mi. 126-0103-2-15D, from Paving Materials Co., 2600 S. Eleanor St., **$35,831**. CD 6/23.

Ill., Chicago—City, Dpt. P. Wks., City Hall, July 20, imprv. W. Division St. to N. Clybourn Ave., from Sensibar Engineering & Paving Co., 33 N. La Salle St., **$211,405**. CD 7/14.

Ill., Chicago—Dpt. P. Wks., City Hall, July 24, concrete paving N. Clark St. from W. Diversey Parkway to W. Addison St., from H. G. Goelitz Co., 5757 W. Ogden St., Cicero, **$180,000**. CD 7/17.

Ill., Danville—Vermilion Co., July 3, imprv. 2.653 mi. Sect. 49 MFT, from E. A. Meyer Constr. Co., N. Park Ave., Highland Park, **$74,978**. CD 6/30.

Indiana—State Hy. Comn., Indianapolis, July 16, bituminous retread surfacing 4.643 mi. State Rd. 45, Martin and Davies Counties, from R. Rogers, Bloomington, **$354,479**.

Md., Baltimore—Bd. Awards, City Hall, July 22, imprv. Contr. S.A. 770, from National Paving & Contg. Co., 4200 Menlo Dr., **$80,677**. CD 7/14—ENR 7/16.

★**Michigan**—State Hy. Dpt., Lansing, July 15, imprv. 1.442 mi. Calhoun Co., from L. W. Edison, 924 Floral Dr. S.E., Grand Rapids, **$70,206***10.704 mi. Cass and St. Joseph Counties, from Michigan Asphalt Paving Co., 1619 Irving Ave., Royal Oak, **$170,092***0.824 mi. Kalamazoo Co., from P. Vanderveen & Sons, 259 Diamond Ave. S.E., Grand Rapids, **$92,509***10.036 Kent Ave., from General Paving Const. Co., 235 Union St. S.E., Grand Rapids, **$182,367***8.94 mi. Lenawee Co., from Cooke Contg. Co., 1216 Penobscot Bldg., Detroit, **$135,933**. CD 7/9.

Minnesota—State Hy. Dpt., St. Paul, July 10, imprv. 3.9 mi. S. Projects 6202-05, 6203-08, 6205-05, 6204-04, 6224-02, 6295-06, DA-WI-1, DA-WI-2, DA-WI-3 and S.P. 6224-02, from Okes Constr. Co., E-1501 1st Natl. Bank Bldg., St. Paul, **$299,456**. CD 6/23—ENR 6/25.

Nebraska—State Dpt. Roads & Irrigation, Lincoln, July 23, grading, culverts, gravel prime coat, armor coat and bituminous material soil cement, on 7.3 mi. Fillmore-York, SN-FA-143 A & G, from H. W. Johnson, 538 Insurance Exch. Bldg., Sioux City, Ia., **$117,760**.

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STREETS, etc. (Low Bidders, Cont'd.)

N. J., Columbia—Pahaquarry Twp., Columbia Hotel, July 14, imprv. 15,440 sq. yd. River Rd. Sect. 7, Pahaquarry, from K. Beck, Blairstown. **$34,795.** CD 7/7—ENR 7/9.

★**Oregon**—State Hy. Comn., Salem, July 23, grading 2.52 mi. bituminous macadam on 4.93 mi. Polk Co., from E. C. Hall, J. C. Compton and McNutt Bros., General Del., Eugene, **$229,154*****4.15 mi. Polk Co., from E. C. Halland, J. C. Compton, General Del., Eugene, **$172,422*****1.88 mi. Multnomah Co., from Porter W. Yett, 6500 N.E. Answorth St., Portland, **$98,853*****18 mi. Malheur Co., from O. C. Yocum, Willamina, **$38,720*****5.99 mi. Coos Co., from Tru-Mix Concrete Co., Medford, **$34,034.** CD 7/14.

†**Texas**—U. S. Eng., Fort Sam Houston, July 24, asphalt roads, walks, from H. Page, P. O. Box 1790, Waco, less than **$50,000.** CD 7/20.

Tex., Houston—Harris Co., c/o Judge, July 12, asphalt paving Bissonnet St., from W. E. Worthen, 6806 U St. **$39,227.** Est. $27,000.

CONTRACTS AWARDED

†**Arkansas**—U. S. Eng., P. O. Box 97, Memphis, Tenn., gravel road, Mississippi Co., to Forcum-James Co., Dyersburg, Tenn., under **$50,000.**

California—State Div. Hys., Sacramento, imprv. 5.7 mi. Yolo Co., to Fredericksen & Westbrook, 212 13 St., Sacramento. **$433,904.** Awarded 7/20. CD 7/14—ENR 7/16.

†**California**—U. S. Eng., Wright Bldg., Sacramento, grading bldg. area, waterbound macadam for streets, roads, to Heimstreet & Bell, 529-12 St., Marysville, under **$50,000.**

†**California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, clearing, grading, paving, fencing, appurtenant facilities, Los Angeles Co., to C. E. Osborn, Sierra Madre Villa Ave., Pasadena, **$50,000-$100,000.**

★†**Colorado**—U. S. Eng., Albuquerque, N. M., roads, drainage, to List & Clarke Constr. Co., and San Ore Constr. Co., Pryor, Okla., **$100,000-$500,000.**

†**Colorado**—U. S. Eng., c/o Postmaster, Denver, grading, to C. V. Hallenbeck, 1114 W. 17 Ave., Denver. Est. under **$50,000.**

★†**Colorado**—U. S. Eng., c/o Postmaster, Denver, grading, to Brown Constr. Co., Colorado Springs. Est. **$1,000,000-$500,000.**

†**Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, paving access roads, timber bridge, to Joe Priest Constr. Co., Del Ray Beach. Est. **$50,000-$100,000.**

†**Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, grading, surfacing, Lowndes Co., to Coffee Constr. Co., Eastman, Ga., under **$50,000.**

†**Florida**—U. S. Eng., Courthouse, Mobile, Ala., grading, paving, drainage, Bay Co., to Coggin & Deermont, Chipley, under **$50,000.**

†**Florida**—U. S. Eng., Postoffice & Courthouse, Jacksonville, roads, Hillsborough Co., to Cone Bros. Contg. Co., Caesar Ave. and Cumberland St., Tampa, under **$50,000.**

†**Georgia**—U. S. Eng., Postoffice Bldg., Savannah, parking areas, streets, driveways, Chatham Co., to Claussen-Lawrence Constr., Augusta, **$50,000-$100,000.**

Georgia—State Hy. Dpt., Atlanta, imprv. 1.8 mi. Clinch Co., to Claussen-Lawrence Const. Co., Augusta, **$303,191;** 8.663 mi. Bibb and Houston Counties, to John Monaghan Inc., Pelham, **$150,817.** Bids 7/17. CD 7/15.

†**Georgia**—U. S. Eng., Courthouse & Postoffice, Jacksonville, Fla., roads, streets, to H. L. Dunn Co., Macon. Est. under **$50,000.**

†**Illinois**—U. S. Eng., 800 Courthouse & Customhouse, St. Louis, Mo., paving roads, etc. to Seneca Petroleum Co., 439 W. 33 St., Chicago.

Ill., Danville—Imprv. road, Sect. 15-CS, to Danville Constr. Co., Box 223. **$27,748.** Bids 6/26, awarded 7/14.

Ia., Tipton—Bd. Supervs. Cedar Co., imprv. 27.1 mi. County trunk and local roads, to B. L. Anderson, Cedar Rapids, **$28,937.** Bids 7/20. CD 7/16.

★†**Kansas**—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., grading, drainage, paving and surfacing, Montgomery Co., to Ottinger Bros., Petroleum Bldg., Oklahoma City, Okla. **$100,000-$500,000.**

★†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, grading, drainage, Vernon Co., to W. R. Aldrich & Co., Kalwrah Univ. Gardens, Baton Rouge, **$100,000-$500,-000.**

Minnesota—State Hy. Dpt., St. Paul, imprv. 7 mi. S.P. 7002-08, to J. Roth Constr. Co., 350 W. Idaho St., St. Paul, and O. W. Braske, 1111 15 Ave. SE, Minneapolis, **$51,995*****10.5 mi. S.P. 6303-13, to Hector Constr. Co., Hector, **$56,050*****8.2 mi. S.P. 2905-09, to Ashworth-Hawkinson Co., St. Louis Park, **$51,448*****9.1 mi. S.P. 7201-12, to Farrell Contg. Co., 1607 Wynne St., St. Paul **$36,765*****11 mi. S.P. 2723-8, to Megarry Bros., St. Cloud, **$131,479.** Grand total $337,737. Bids 7/10. CD 6/23—ENR 6/25.

Minnesota—State Hy. Dpt., St. Paul, imprv. 100.7 mi. roads, Group B, Dist. 4, to Iowa Road Bldg. Co., 1495 Keo Way, Des Moines, Ia., **$45,524*****55.01 mi. Group C, Dist. 6, to Duininck Bros. & Gilchrist, Ol[illegible] $34,935*** 80.64 mi. Group D, Dists. 6 [illegible] worth-Hawkinson Co., St. Lou[illegible] $38,431 Grand total $115,890. Bids [illegible] bids July 17, imprv. 5.2 mi. (Trunk Hy. 75-6). SN-A-FAP [illegible] readvertise. CD 6/30—ENR 7[illegible]

†**Nebraska**—U. S. Eng., 1709 Omaha, roads, parking area[illegible] Kiewitt Sons Co., Omaha Nati[illegible] Omaha. Est. less than **$500,000.**

New Jersey—Atlantic Co., Cou[illegible] lantic City, removing trolley [illegible] grading, repaving track area, W[illegible] $55,9[illegible] D. W. Haining, 930 Atlantic A[illegible] City, WPA engr.

N. J., Jersey City—City, City H[illegible] reconstructnig asphalt surfaces, [illegible] walks, pipes, sewers, drainage, [illegible] mont, Colden and Prior Sts., WPA [illegible] $114,531. C. Malstrom, Orange and N. 6 St[illegible] WPA engr.

★†**New York**—U. S. Eng., 960 [illegible] Bldg., Buffalo, grading, dra[illegible] ing, fencing, to Depew Paving [illegible] pew, and Schultz Contg. Co., Inc[illegible] wood Ave., Buffalo. Est. **$100,000-$500,000.**

★**Ohio**—State Hy. Dpt., Columb[illegible] 8.439 mi. Wayne Co., to Mi[illegible] Co., 100 Hazel St., Akron, $118,554, $132,070***1.748 mi. Scioto Co., to Brewer & Brewer Sons, Inc., 81 W. Wate[illegible] licothe, **$27,177,** est. $27,180***4.155 mi. Montgomery Co., to Visintine & Co., 1[illegible] mut St., Columbus, **$191,300,** est. [illegible] 2.025 mi. Medina Co., and 1.613 mi. [illegible] and Ottawa Counties, to Ohio Road Improvement Co., Chamber of Commerce Bldg., Columbus, **$35,080** and **$28,311** respectively***. 42 mi. Lucas and Ottawa Counties, to Arthur S. Langenderfer, Inc., 4690 W. Bancroft St., Toledo, **$81,656***2.984 mi. Lake Co., to Cuyahoga Asphalt Paving Co., Shaker Sq., Cleveland, **$53,280,** est. $53,380***4.895 mi. Delaware Co., to L. L. Clymer, West Jefferson, $41,884, est. $54,620. Grand total $577,442. Bids 7/22. M. Received no bids July 21, imprv. 9.174 mi. Washington Co., $16,900. CD 7/8—ENR 7/16.

★†**Ohio**—U. S. Eng., 649 Federal Bldg., Detroit, Mich., roads, sidewalks, etc. to Cook Const. Co., 2401 Barlum Tower, Detroit, Mich. Est. less than **$1,000,000.**

★†**Oklahoma**—U. S. Eng., 231 W. Main St., Denison, Texas., grading, roads, streets and drainage, Tillman Co., to Vilbig Constr. Co., Paris and Bourbon Sts., Dallas, Tex. **$100,000-$500,000**

Okla., Tulsa—Tulsa Co., grading, drainage, concrete slab, 3.93 mi. road to Layman Const. Co., 3001 Riverside Dr. **$136,198.** Bids 7/6. M. C. Shibley, Tulsa, engr.

Okla., Tulsa—Tulsa Co., paving 1.16 mi. 36 St. N., to Standard Paving Co., 119 E. 11 St., **$43,553.** Est. $43,713. Awarded 7/22. M. C. Shibley, County Courthouse, engr.

†**Oregon**—U. S. Eng., 628 Pittock Blk., S.W. Portland, roads, bridges, drainage ditch, to Russell Olson, Medford. Est. under **$50,000.**

★**Pennsylvania**—State Hy. Dpt., Harrisburg, imprv. 19,083 ft. Washington Co., to Harrison Constr. Co., 1101 Western Ave., Pittsburgh, **$657,343.** Bids 6/30, awarded 7/20. CD 7/2—ENR 7/9, under LB.

★†**South Carolina**—U. S. Eng., 33 Customhouse, Charleston, paving, to R. B. Tyler Co., 1446 Levering St., Louisville, Ky., **$100,-000-$500,000.**

★†**South Dakota**—U. S. Eng., Fort Peck, Mont., roads and bldg. fdns., Fall River Co., to W. H. Noel Co., Jamestown, N. D. **$100,000-$500,000.**

†**Tennessee**—Tennessee Valley Auth., Knoxville, imprv. 6.5 mi. Proj. 8-1106, to H. W. Caldwell & Sons, Murfreesboro***2.3 mi. Proj. 8-4010, to Porter DeWott Constr. Co., Poplar Bluff, Mo. and Hart & Hart, Murray, Ky.***2.8 mi. Proj. 20-4509, to Kearney & Stark, Keokuk, Ia.; 3.9 mi. Proj. 20-4512, and Proj. 20-4506, to Codell Constr. Co., Winchester, Ky. CD 6/2—ENR 6/4.

★†**Tennessee**—U. S. Eng., 307 U. S. Courthouse, Nashville, roads, drainage, to T. M. Striden & Co., Cotton States Bldg., Nashville. Est. less than **$3,000,000.**

Tenn., Chattanooga—W. Cummins, judge Hamilton Co., farm-to-market roads, **WPA. $50,000.**

†**Texas**—U. S. Eng., Fort Sam Houston, constructing roads, sidewalks, Spec. 42-177, to Southern States Const. Co., 203 San Jacinto Natl. Bank Bldg., Houston, less than **$100,000.** CD 7/8—ENR 7/16.

†**Texas**—U. S. Eng., San Antonio, roads, sidewalks and fencing, Bexar Co., to Atkin & Hinman, Corpus Christi, under **$50,000.**

★†**Texas**—U. S. Eng., Fort Sam Huston, access roads, asphalt paving. Spec. 42-180, to M. E. Ruby and Wallace & Bowden, Littlefield, Austin. **$100,000-$500,000.** Bids 7/11, awarded 7/20. CD 7/8.

Utah—State Road Comn., J. S. Evans, chn., Salt Lake City, imprv. 0.083 mi. Davis Co., to Clifford Prince, 2265 Lake St., Salt Lake City, **$28,249.** Est. $30,836. Bids 7/17. CD 7/12.

Utah—State Roads Comn., Salt Lake City, imprv. 5.154 mi. road from N. Temple to 33 S Sts., to A. O. Thorne, Springville, **$358,-552.** Est. $263,000. Bids 7/6. Reconsideration. CD 7/21—ENR 7/23.

STREETS, etc. (Contracts Awarded, Cont'd.)

Utah—State Roads Comn., Salt Lake City, impvr. 3.424 mi. Davis Co., to Reynolds-Ely Constr. Co., Springville, **$45,750**, est. $36,648; 2.195 mi. Utah Co., to O. Nelson, Logan, **$148,494**, est. $139,901. Bids 7/20. CD 7/13.

★ **†Washington**—U. S. Eng., Textile Tower, Seattle, roads, walks, sanitary facilities, to R. L. Bair, 1220 Ide Ave., Spokane, **$100,000-$500,000**. CD 6/23—ENR 6/25.

Ont., Camp Borden—Dpt. National Defense, Ottawa, surfacing grounds and roadways at Army Camp, to Brennan Paving Co., Ltd., 400 Gage Ave. N., Hamilton. **$25,000.**

EARTHWORK, WATERWAYS

PROPOSED WORK

†California—U. S. Eng., Wright Bldg., Sacramento, received no bids July 18, 2.6 mi. east levee Cache Creek and west levee Hass Slough, Inv. 106. CD 7/9.

Ia., Council Bluffs—City, surveys cleaning mud from concrete enclosed channel, Indian Creek. $96,000. J. Boyne, city engr.

S. D., Yankton—Anna M. Goetz, city aud., flood protection work at river bank Missouri River to protect water plant and high school athletic field. $15,000.

Wis., La Crosse—Dike to prevent floodwaters on La Crosse River. $26,000. J. H. Barth, city engr.

BIDS ASKED

Bids Asked August 4

Ont., Willowdale—H. D. Goode, clk. North York Twp., river diversion, etc. $25,000. G. H. Baker, Township Hall, engr.

Bids Asked August 7

†Arkansas—U. S. Eng., P. O. Box 97, Memphis, Tenn., 3,435,000 cu. yd. earthwork, White River Levee Dist. (White River Backwater Levee).

Bids Asked August 10

†La., New Orleans—U. S. Eng., foot of Prytania St., 1,000,000 cu. yd. earthwork, Inv. 43-37.

Bids Asked August 11

†California—Bureau Reclamation, Customhouse, Denver, Colo., surge tank and oil tank for Shasta Dam, Kennett Div., Central Valley Project, Spec. 1656-D.

Bids Asked August 12

†Idaho—Bureau Reclamation, Denver, Colo., 15 sets hoist-deck metalwork for spillway section American Falls Dam, Minidoka project. Spec. 1657-D.

Bids Asked August 13

La., Lafayette—Police Jury Lafayette Parish, Courthouse, enlarging channels following streams; 71,627 cu. yd. Bayou Carencro, 64,777 cu. yd. Indian Bayou, 71,627 cu. yd. Coulee Granger, 90,572 cu. yd. Coulee Iles Des Cannes, 37,000 cu. yd. Lateral C, 62,327 cu. yd. Lateral D and 72,870 cu. yd. Lateral E of Iles Des Cannes, 59,202 cu. yd. Coulee Des Poches, 73,400 cu. yd. Debaillion Coulee, 38,002 cu. yd. Lateral A and 32,040 cu. yd. Lateral A-1 of Coulee Debaillion, 58,155 cu. yd. Bayou Parc Perdue, 55,870 cu. yd. Coulee Mine, 24,298 cu. yd. Coulee Anselm, 37,628 cu. yd. Lateral 3, 79,776 cu. yd. Lateral 4, and 73,997 cu. yd. Lateral 5, Bayou Tortue, 36,707 cu. yd. watershed 6 and Laterals 4 and 6. Plans deposit 5% of bid amount.

Bids Asked August 14

†Colorado — Bureau Reclamation, Estes Park, preparation concrete aggregates, Big Thompson Meadows Deposit, Big Thompson project, Spec. 1655-D.

LOW BIDDERS

Calif., Long Beach—Bd. Supervs. Los Angeles Co., Hall of Records Bldg., Los Angeles, July 21, constructing Los Cerritos channel, near here, from J. F. Immel, P. O. Box 43, Ventura, **$39,200.** CD 7/13.

CONTRACTS AWARDED

†Arkansas—U. S. Eng., P. O. Box 60, Vicksburg, Miss., 132,700 cu. yd. levee on east bank of Red River, Inv. 1106-42-250, to Henry B. Honsby, Bossier City, La. Bids 7/7. CD 6/30—ENR 7/2.

Calif., San Diego—Dredging 315,000 cu. yd. Area C San Diego Bay, to Standard Dredging Corp. Pier I, foot of Bway., **19.9c.** per cu. yd. J. Brennan, Harbor Bldg., engr.

†Illinois—U. S. Eng., Courthouse & Customhouse, St. Louis, Mo., pile driving, Macon Co., to Whetzel Bros., Champaign, under **$50,000.**

†La., New Orleans—U. S. Eng., foot of Prytania St., New Orleans, 7,217 lin. ft. wooden revetment, to Saunee & DeArmas, 5120 Conti St. Bids 6/8, awarded 7/21. CD 5/13—ENR 5/21.

†Minnesota—U. S. Eng., Postoffice Bldg., St. Paul, channel dredging and launching basin excav., to Albert Kertzman, Winona. Est. **$50,000-$100,000.**

†Minn., Hastings—U. S. Eng., 1217 Main Post Office Bldg., St. Paul, approach channel

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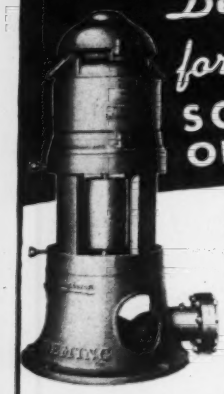
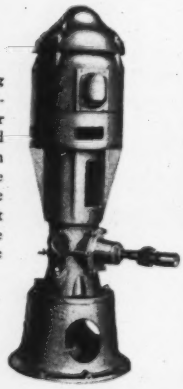


Deming Turbines with combination heads assure a continuous supply of water even during periods of current failure.

At left, a Deming Turbine with motor and belt head.



At right, a Deming Turbine with combination motor and gear head. The geared head is mounted between motor and discharge head. Motor can be hollow or solid shaft of either demountable or non-demountable construction.

NOTE THESE FEATURES!

Deming Deep Well Turbines are engineered for dependable, low cost operation. Among their many features are water lubrication; cutless rubber bearings; non-reverse ratchet which prevents pump starting in wrong direction due to improper wiring; adjustable impeller clearance; stainless steel impeller shaft in bowl assembly; and many other features. Capacities range from 15 to 2000 G. P. M.

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Write for illustrated Bulletin 4700-8 which contains large views of Deming Turbine Pump construction and technical data.

SPECIFY DEMING PUMPS

EARTHWORK, etc. (Contracts Awarded, Cont'd.)

dredging and access road, Mississippi River, Lock and dam 2, 2 sections, to LaCrosse Dredging Co., 411 Plymouth Bldg., Minneapolis; rest of work, own forces. Bids 6/23.

†Minn., St. Paul—U. S. Eng., 217 Main Post-office Bldg., St. Paul, rock excav. in Minnesota River, to C. Bolander & Sons Co., 2933 Pleasant Ave., Minneapolis. CD 6/16—ENR 6/18.

†Tex., Denison—U. S. Eng., Citizens Bank Bldg., Denison, surge tank and penstock for Red River Dam, to Chicago Bridge & Iron Co., 1305 W. 105 St., Chicago, Ill. **$140,000.**

Tex., Raymondville—Willacy Co. Water Control & Imprvt. Dist. 2, addnl. imprvs. to canal irrigation sys., raising canals, deepening ditches, etc., **WPA. $72,000.**

†Virginia and **North Carolina**—U. S. Eng., 308 Customhouse, Wilmington, N. C., dredging, various counties above states, to Norfolk Dredging Co., Campostella Wharf, Norfolk, Va., under **$50,000.**

UNCLASSIFIED

PROPOSED WORK

★**†Arizona**—IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, imprvs. Over $3,000,000.

Ark., Fayetteville—AIRPORT—Imprv. enlarging municipal airport. $100,000. E. Brown, Fayetteville, engr.

Arkansas, North Little Rock—RAILROAD YARD IMPROVEMENTS—Missouri Pacific R.R., F. E. Bates, ch. engr., 13 and Olive Sts., St. Louis, Mo., railroad yard imprvs., 5 addnl. tracks, freight handling facilities, etc. $174,-100.

†California — IMPROVEMENTS — Natl. Advisory Com. for Aeronautics, Moffett Field, Sunnyvale, imprvs., bldg.

★**†Colorado**—IMPROVEMENTS—U. S. Eng., Albuquerque, N. M., imprvs. Over $5,000,-000.

†Colo., Grand Junction—AIRFIELD—City, lengthening runways, taxiways. $126,000. CAA.

†Connecticut — PLAYGROUNDS, etc.—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., playgrounds, landscaping, grading, for housing. Over $25,000.

†Connecticut — LANDSCAPING, etc. — Pub. Housing Auth., NHA, 24 School St., Boston, Mass., completing plans landscapings, grading for housing, Projects Conn. 6071 and 6072. Over $25,000.

†D. C., Wash.—IMPROVEMENTS—U. S. Eng., 1 and Douglas Sts., N.W., Wash., D. C., plans by Perring & Remington, engrs. and archts., 10 W. Chase St., Baltimore, Md. hardstandings and taxiways.

†Florida — IMPROVEMENTS — U. S. Eng., Courthouse, Mobile, imprvs.

†Iowa—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, Neb., imprvs., bldg. $50,000.

★**†Kansas**—IMPROVEMENTS—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., imprvs., housing. $3,000,000. Project abandoned. CD 6/30—ENR 7/2, under LB.

Massachusetts — IMPROVEMENTS—Bethlehem-Hingham Shipyard, Inc., E. Howard St., Quincy, soon lets contract, imprvs., bldg. $40,000. CD 7/14—ENR 7/16.

Minn., Mankato—AIRPORT—Plans special $250,000 bond election airport.

†Nebraska—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., addnl. bldgs. G. M. Musick, Security Bldg., Denver, Colo., engr. and archt.

Neb., Hartington—AIRPORT—P. H. Gillaspie, City clk., airport. $50,000.

†New Mexico — IMPROVEMENTS — U. S. Eng., Albuquerque, imprvs., sewage disposal plant. $120,000. Plans deposit $25.

★**†New Mexico** — IMPROVEMENTS — U. S. Eng., Albuquerque, imprvs., bldgs. Over $3,000,000.

N. C., Sanford—AIRPORT—F. O. Radcliff, Charlotte and B. McKenzie, Hopewell, Va., airport, 28 acre site, 2 mi. from here, near Jonesboro.

Pa., Finleyville—MINE DEVELOPMENT—Daugherty Coal Co., H. C. Daugherty, pres., Finleyville, rehabilitation mine, dewatering abandoned mine, etc. Carroll Twp., near here. $80,000.

★**†South Dakota** — IMPROVEMENTS — War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., imprvs. Over $500,000.

†South Dakota — IMPROVEMENTS — War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., imprvs.

†Texas — ELECTRICAL DISTRIBUTING SYSTEM—U. S. Eng., Fort Sam Houston, bids withdrawn, for overhead outdoor electrical distr. sys. and natural gas distr. lines, facilities, Spec. 42-146-T6-I.

†Texas — IMPROVEMENT... Fort Sam Houston, bids so... 42-223. Plans deposit $25.

†Texas — PIPELINE — R... nance Corp., 811 Vermont A... D. C., pipeline. $70,000.

Texas—RURAL ELECTRIC... Electric Cooperative, Hondo, ... electric power transmission ... REA allot. J. W. Beretta Eng... Bank Commerce Bldg., San A...

★**†Tex., Houston**—AIRPORT... ing municipal airport, ex... facilities. $1,000,000.

★**Utah**—TRAFFIC CONTRO... —Denver & Rio Grande W... A. E. Periman, ch. engr., ... Denver, Colo., modern centrali... trol sys. between Agate and ... $435,907; relocating main track ... City, $250,000; ballasting ... $134,032, new tracks, imprvs. ... Branch $116,900.

†Washington—POWER LINE... Eng., 809 3 Ave., Seattle, plan... Rasque & Son, engr. and arch... Trust Bldg., Spokane, power lin... tion, Spokane Co.

Washington — IMPROVEMEN... Shipbuilding Co., 420 Wall St., S... Over $40,000.

Wis., La Crosse—AIRPORT—... election in September, airport. Plans ap... cation to WPA. J. H. Barth, city engr. CD 6/17—ENR 6/25.

†Pacific Northwest—UTILITIES—U. S. Eng., Textile Tower, Seattle, Wash., utility sys.

★**Ont., Fort William**—AERODROME—... Dpt. Transport, Ottawa, extensive ... aerodrome, hardsurfaced runways, taxi ... drainage, etc. $895,000.

BIDS ASKED

Bids Asked August 3

†Vermont — TOWER — Civil Aeronautics Admin., P. O. Box 636, La Guardia Field, Jackson Heights, N. Y., tower, No. 1-43-151.

Bids Asked August 4

Ont., Petawawa—AIR FORCE ACCOMMODATIONS—Secretary Dpt. Munitions & Supply, Ottawa, addnl. accommodations at Military Camp, Locations A1 and A2, RCAF for Dpt. National Defense, Ottawa. $250,000.

Bids Asked August 6

★**Wash., Seattle**—DAM—City, County-City Bldg., raising Ross Dam, rein.-con. variable arch hydro-electric, on Skagit River, from Elevation 1360 to Elevation 1545. Total est. $8,000,000. Plans deposit $25; furnishing 437,-500 bbl. cement; two self-closing Broome sluice gates for opening 6 ft. wide and 8 ft. high complete with traveling hoist; two 72 and two 48 in. discharge regulating valves. E. R. Hoffman, City Light Bldg., engr. CD 6/15—ENR 6/18.

Bids Asked August 8

†Arkansas—FENCE—U. S. Eng., Gay Bldg., Little Rock, 13 mi. barbed wire fence, U. S. Eng. 7-17-42; 13 mi. barbed wire fence. Plans deposit $5.

Bids Asked about August 24

★**†Oregon**—IMPROVEMENTS—Oregon Shipbuilding Corp., St. St. Johns, Portland, imprvs. $550,000. Funds appropriated by U. S. Maritime Comn.

Bids Asked August 25

†Utah, Delta—GRADING, etc.—Civil Aeronautics Admin., 1500 4 St., Santa Monica, Calif., grading, paving, drainage airport. Proposal 63-88. Over $25,000. Plans deposit $10.

Bids Asked

†Texas — ELECTRICAL DISTRIBUTING SYSTEM—U. S. Eng., Fort Sam Houston, outdoor overhead electrical distr. sys., Spec. 42-216. Est. about $25,000. Plans deposit $25.

†Texas — GAS DISTRIBUTION SYSTEM — U. S. Eng., Fort Sam Houston, steel natural gas distr. sys. About $25,000. Plans deposit $25. CD 7/21—ENR 7/23.

†Texas—IMPROVEMENTS—U. S. Eng., Federal Bldg., Galveston, imprvs. bldg., roads, plans deposit $50; for grading, installing fuel sys., over $25,000, plans deposit $50; natural gas distr. sys., $25,000, plans deposit $25; outdoor overhead electrical distr. sys., $25,000, plans deposit $25.

†Texas—IMPROVEMENTS—Todd Drydock, Inc., Pelican Dike, imprvs. $275,000. G. Rustay, Electric Bldg., Houston, archt.

LOW BIDDERS

†Alabama—RAILROAD SPUR—U. S. Eng., 306 Courthouse, Nashville, Tenn., railway spur, from R. J. Contg. Co., 2109 N. 14 St., Birmingham.

†California—IMPROVEMENTS—U. S. Eng., Wright Bldg., Sacramento, July 21 imprvs., gas, waste, water, electric facilities, from Andrew A. Pollia, 105 18 Ave., San Francisco, less than $50,000.

†Illinois—LAWNS and PLANTING—Skidmore, Owens, Merrill, archts., 104 S. Michigan

UNCLASSIFIED (Low Bidders, Cont'd.)

Ave., Chicago, July 7, lawns and planting, for Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, from Louisville Nurseries, Shelbyville Rd., Louisville, Ky., **$63,900.** CD 6/26—ENR 7/2.

†**Louisiana**—IMPROVEMENTS—U. S. Eng., foot of Prytania St., New Orleans, imprvs., bldg., warehouse, fence, Inv. 43-17, from L. F. Favret, 937 Gravier St., New Orleans.

†**Nevada**—IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, July 23, imprvs., Inv. 125, from Gibbons & Reed Co., 259 W. 3 St., Salt Lake City, Utah.

★†**New Hampshire** — IMPROVEMENTS — U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., July 20, imprvs., from Carlo Bianchi & Co., Inc., Union Ave., Framingham, Mass. **$500,000-$1,000,000.** CD 7/18. CD 7/16.

†**Texas**—GASOLINE STORAGE SYSTEM, etc.—U. S. Eng., Fort Sam Houston, July 21, A.C. gasoline storage and dispensing sys., from Aqua System, Inc., 385 Gerard Ave., New York, N. Y. CD 7/17.

★†**Texas**—IMPROVEMENTS—U. S. Eng., Fort Sam Houston, from Texas Bitulithic Co. & Associates, Dallas, imprvs. Spec. 42-170, **$500,000-$1,000,000** *** from Panhandle-Sirax-Dalton Co., 3101 Elm St., Dallas, installing sanitary sewerage sys., Spec. 42-169, **$100,000-$500,000**; gasoline storage and dispensing sys., Spec. 42-171, **$50,000-$100,000**; natural gas distr. sys., facilities, Spec. 42-169, **$50,000-$100,000**; water sys., Spec. 42-169, **$100,000-$500,000.**

†**Texas**—FUEL PUMPHOUSE, etc.—U. S. Eng., Fort Sam Houston, fuel pump house, motor fuel storage, etc., Spec. 42-129 (T3-1), from J. R. Blackmore & Sons, Austin, **$50,000-$100,000.** CD 6/25—ENR 7/2.

★†**Texas** — IMPROVEMENTS — U. S. Eng., Fort Sam Houston, imprvs. bldgs., from J. W. Bateson, Box 432, Paris, to exceed **$3,000,000.** CD 7/9—ENR 7/16.

†**Texas** — IMPROVEMENTS — U. S. Eng., Denison, imprvs., asphalt paving, installing overhead electrical lighting facilities and grading and drainage, both Inv. 257-42-262, from J. F. Buckner, Cleburne, **$100,000-$500,000.**

★†**Texas** — IMPROVEMENTS — U. S. Eng., Fort Sam Houston, July 21, imprvs., Group A, bldgs., from J. E. Dickey, 216 Eleanor St., San Antonio, **$500,000-$1,000,000** ***Group B, bldgs., from Walsh & Burney Co., 928 N. Flores St., San Antonio, **$1,000,000-$5,000,000*****Group C, bldgs., from J. Morrow, Houston, **$500,000-$1,000,000*****sewage disposal plant, from G. W. Mitchell, Builders Exch. Bldg., San Antonio, **$100,000-$500,000.** CD 7/9

★†**Texas** — IMPROVEMENTS — U. S. Eng., Federal Bldg., Galveston, imprvs., concrete paving 960,000 sq. yd., excavating 670,000 cu. yd., paving only, from Globe, Montgomery & Whitham Esperson Bldg., Houston, approx. **$500,000-$1,000,000,** est. $900,000; paving and all dirt work complete, from Cage Bros. & Williams, Box 972, Austin, **$500,000-$1,000,000.** CD 7/8—ENR 7/16.

†**Utah**—IMPROVEMENTS—U. S. Eng., 32 Exchange Pl., Salt Lake City, imprvs., from W. E. Callahan Const. Co., 714 Olympia Blvd., Los Angeles, Calif.

CONTRACTS AWARDED

†**Alabama**—FOUNDATIONS—U. S. Eng., 494 Spring St., N.W., Atlanta, Ga., concrete foundations, steel crane frame, Calhoun Co., to R. A. Smallman & Co., Inc., 1109-5 Ave. S., Birmingham, under **$50,000.**

†**Alabama**—IMPROVEMENTS—U. S. Eng., Courthouse, Mobile, imprvs. grading, drainage, paving, fencing, Inv. 569-43-28, to Mitchell Bros. Constr. Co., 3828 1 Ave. S., Birmingham.

†**Alabama**—IMPROVEMENTS—U. S. Eng., Courthouse, Mobile, imprvs., grading, paving, drainage, to A. L. Crow Constr. Co., 11-41 St. S., Birmingham. Bids 7/6. CD 7/15—ENR 7/23, under LB.

†**Alabama**—SODDING—U. S. Eng., Courthouse, Mobile, sodding railroad embankments, Montgomery Co., to J. C. Hardy & F. M. Vaughan, Jr., Columbus, Miss., under **$50,000.**

†**Arizona**—FENCE—U. S. Eng., Albuquerque, N. M., fence, Coconino Co., to George C. Gammill, Prescott, under **$50,000.**

†**Arizona**—FENCING—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., fencing, Mohave Co., to D. W. Burkett, 2419 S. La Cuenega Blvd., Los Angeles, Calif., under **$50,000.**

†**Arizona** — IMPROVEMENTS — U. S. Eng., 751 S. Figueroa St., Los Angeles, imprvs., No. 110, to Arizona Constructors, 304 Home Builders Bldg., Phoenix. Bids 7/17, awarded 7/23.

†**Arizona**—RAILROAD SPUR—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., railroad spur, to J. C. Kelton, 4525 N. 7th St., Phoenix. Bids 7/8.

★†**Arkansas**—GASOLINE FUELING SYSTEM—U. S. Eng., P. O. Box 97, Memphis, Tenn., A. C. Gasoline fueling sys., No. 1092-42-224F, to Forcum-James Co., Dyersburg, Tenn. Est. less than **$1,030,000.**

★†**Arkansas**—IMPROVEMENTS—U. S. Eng., P. O. Box 97, Memphis, Tenn., imprvs.,

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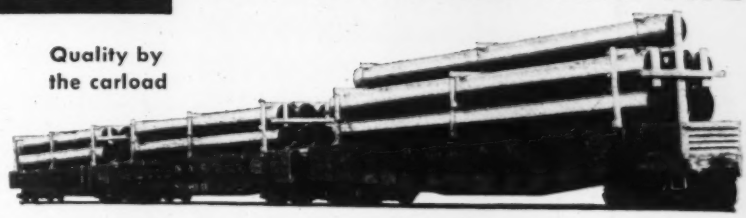

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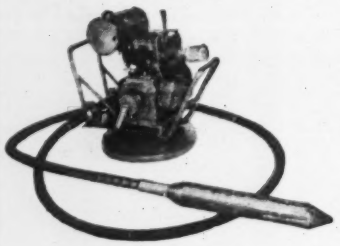

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

sewage treatment works, to Wyatt L. Sharpe Contg. Co., Columbian Mutual Tower Bldg., Memphis, Tenn. Est. less than **$1,000,000.**

★**†Arkansas**—IMPROVEMENTS—U. S. Eng., Gay Bldg., Little Rock, imprvs., to E. W. Hallett & Jessie Hallett, and Anderson & Sons, 100 N. 7 St., Minneapolis, Minn. Est. **$1,000,000-$5,000,000.**

†California—ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., 74 New Montgomery St., San Francisco, electrical distr. sys. exten., to N. A. Russell, Santa Rosa. Est. under **$50,000.**

★**†California** — IMPROVEMENTS — U. S. Eng., 74 New Montgomery St., San Francisco, imprvs., to Love & Haun, 4354 20 St., San Francisco, under **$1,000,000.** Awarded 7/21.

★**†California** — IMPROVEMENTS — U. S. Eng., 74 New Montgomery St., San Francisco, imprvs., to Macco Constr. Co., 815 Paramount Blvd., Clearwater, under **$1,000,000.** Awarded 7/21.

★**†California** — IMPROVEMENTS — U. S. Eng., Wright Bldg., Sacramento, imprvs., to Pacific Rock & Gravel Co., 208 W. 8 St., Los Angeles. **$100,000-$500,000.**

★**†California** — IMPROVEMENTS — Government Agency, constructing, operating, imprvs., to Barrett & Hilp, 918 Harrison St., San Francisco.

★**California**—IMPROVEMENTS—U. S. Eng., 74 New Montgomery St., San Francisco, imprvs., bldg. addn., alterations, to P. C. Gibson, 372 Velarde St., Mountain View*** imprvs., to U. B. Lee, 1159 Estudillo Ave., San Leandro, and L. M. Clough Co., 996 66 Ave., Oakland***bldg., to Jacks & Irvine, 620 Market St., San Francisco***bldg., to Wells P. Goodenough, 49 Wells Ave., Palo Alto*** bldg., to D. W. Nicholson, 1701 San Leandro Blvd., San Leandro, and J. J. Moore, 354 Hobart St., Oakland. Each contract under **$1,000,000.**

†California—IMPROVEMENTS—U. S. Eng., Wright Bldg., Sacramento, imprvs., to A. Teichert & Son, Inc., Box 1113, Sacramento.

†California—PROTECTIVE FENCE LIGHTING—U. S. Eng., 751 S. Figueroa St., Los Angeles, protective fence lighting, Los Angeles Co., to Electric Machinery Service, 424 E. 3 St., Los Angeles, under **$50,000.**

†California—RAILROAD TRACKAGE—U. S. Eng., 751 S. Figueroa St., Los Angeles, railroad trackage, Los Angeles Co., to H. B. Nicholson, 1151 S. Bway., Los Angeles, under **$50,000.**

★**California**—RAILROAD TRACKAGE—U. S. Eng. 751 S. Figueroa St., Los Angeles, Calif., railroad trackage, Riverside Co., to H. B. Nicholson, 1151 S. Bway., Los Angeles. **$100,000-$500,000.**

†Connecticut — PILING — U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., piling, to J. F. Watrous, New London Road, Mystic. Bids 6/29. CD 6/19—ENR 6/25.

†Delaware—ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., Penn Mutual Bldg., Phila., Pa., aerial electrical distr. sys., to Ford & Morris, 4525 N. Broad St., Phila., Pa. Est. under **$50,000.**

†Florida — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., Courthouse & Postoffice, Jacksonville, electrical distr. sys., to Geo. La Vigne Electric Co., 176 N.E. 20 St., Miami. Est. under **$50,000.**

★**†Florida**—IMPROVEMENTS—U. S. Eng., Courthouse & Postoffice, Jacksonville, imprvs., paving, to Cornell Young Co., Macon, Ga. Est. **$100,000-$500,000.**

Florida — IMPROVEMENTS — Industrial Company, imprvs., bldg., to Gallespie Const. Co., Inc., 220 W. Church St., Jacksonville, **$100,000.** Hope Eng., Co., 858 E. Bay St., Jacksonville, engr.

†Florida — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., Courthouse & Postoffice, Jacksonville, electrical distr. sys., Dade Co., to Ingalls Electric Co., 961 S.W. 2 St., Miami, under **$50,000.**

★**†Florida**—IMPROVEMENTS—U. S. Eng., Courthouse & Postoffice, Jacksonville, imprvs., A.C. oil storage sys., Gulf Co., to J. O. Carlisle, Tallahassee***roads, Inv. Neg.-Jax-43-4, and imprvs., Inv. Neg.-Jax-43-1, to Cone Bros. Const. Co., Caesar Ave. and Cumberland St., Tampa***imprvs., Inv. Neg.-Jax 43-31, to Ryan Const. Co., Stovall Office Bldg., Tampa***electrical distr. sys., Inv. Neg.-Jax 43-6, to Miller Elec. Co., 556 Riverside Ave., Jacksonville***electrical distr. sys., Inv. Neg.-Jax 43-5, to C. M. Gudgeon, Jacksonville***electrical distr. sys., to H. G. Garvin Elec. Co., Orlando***wash racks, service facilities, to B. B. McCormack & Sons, Graham Bldg., Jacksonville***heating sys., to Brearley Plumbing Co., 824 N. W. 75 St., Miami***laminated arches and trusses, to Townsend Sash, Door & Lumber Co., 1541 Fuller St., Tampa, each contract less than **$1,000,000.**

†Florida—HEATING SYSTEM—U. S. Eng., Courthouse & Postoffice, Jacksonville, gas fired heating sys., Monroe Co., to Brearley Plumbing Co., 824 N.W. 75 St., Miami, under **$50,000.**

†Florida — STEAM DISTRIBUTION SYSTEM—U. S. Eng., Courthouse & Postoffice, Jacksonville, central steam distr. sys., Palm Beach Co., to D. W. Browning, Daytona Beach, **$50,000-$100,000.**

†Florida — TARGET RANGE — U. S. Eng., Courthouse & Postoffice, Jacksonville, target range, Hillsborough Co., to Chambliss Co., 213 E. Oak Ave., Tampa, **$50,000.**

†Georgia—PARKING APRON—U. S. Eng., 494 Spring St. N.W., apron, storm drainage, Fulton Co., to Driveway Co., Inc., 34 North Ave. N.E., Atlanta, **$50,000-$100,000.**

★**†Georgia**—LIGHTING SYSTEM—U. S. Eng., Courthouse & Postoffice, Jacksonville, Fla., lighting sys., Inv. 175-43-NEG 8, to Randall Elec. Co., Spartansburg, S. C. **$1,000,000.** Awarded 7/11.

★**†Idaho** — IMPROVEMENTS — U. S. Eng., Pittock Blk., Portland, Ore., imprvs., to Morrison-Knudsen Co., Inc., 1919 Bank Bldg., Boise. **$100,000-$500,000.**

†Idaho—RUNWAY REPAIRS—U. S. Eng., Pittock Blk., Portland, Ore., Municipal Airway, Ada Co., to Vernon Bros., 815 S. 80 and Orchard Ave., Boise, under **$50,000.**

†Idaho—TARGET FACILITIES—U. S. Eng., Pittock Blk., Portland, Ore., target facilities, Pocatello Co., to C. M. Merrill Co., 1919 Lancaster Bldg., Brentwood St., Portland, Ore., under **$50,000.**

†Illinois—ELECTRIC DISTRIBUTION SYSTEM—U. S. Eng., 800 Courthouse & Customhouse, St. Louis, Mo., electric distr. sys., to A. A. Electric Co., 3125 S. 60 Court, Cicero, Ill.

†Illinois—MONO-RAIL—U. S. Eng., Courthouse & Courthouse, St. Louis, Mo., mono-rail, to LaSalle Iron Works, 3110 LaSalle St., St. Louis, Mo.

†Indiana — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., 612 Federal Bldg., Louisville, Ky., electrical distr. sys., to Anderson Co., to A. Wood Harding, New Albany, **$50,000-$100,000;** motor fuel and dispensing sys., Jackson Co., to Hipskind Heating & Plumbing Co., 1725 Winter St., Ft. Wayne, under **$50,000.**

†Iowa—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, Neb., imprvs., bldgs., to Hugh Davey & Son, Mason City. Est. under **$50,000.**

Ia., Ottumwa — ATHLETIC FIELD — Bd. Educ., Ottumwa, athletic field. WPA **$104,000.**

†Kansas—GASOLINE SYSTEM, etc.—U. S. Eng., 10 E. 17 St., Kansas City, Mo., gasoline and fueling sys., oil storage and dispensing sys., Shawnee Co., to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y.

†Kansas — IMPROVEMENTS — U. S. Eng., 10 E. 17 St., Kansas City, Mo., imprvs., to Koss Constr. Co., Old Colony Bldg., Des Moines, Ia.

†Kansas — IMPROVEMENTS — U. S. Eng., Davidson Bldg., Kansas City, Mo., imprvs., addnl. bldgs., to Jonson, Peterson, Bushom & Rah, Salina.

†Louisiana—GREASE RACKS, etc.—U. S. Eng., foot of Prytania St., New Orleans, grease and inspection racks, Vernon Parish, to A. A. Mutersbaugh, Lake Charles. Awarded 7/20.

†Maine—GASOLINE DISTRIBUTION SYSTEMS—U. S. Eng., Park Square Bldg., Boston, Mass., gasoline distr. sys., Inv. 175-43-NEG 6, and 175-43-NEG 7, to Aqua Systems, Inc., 250 Stuart St., Boston, Mass. CD 7/23.

†Maine — IMPROVEMENTS — U. S. Eng., Park Square Bldg., Boston, Mass., imprvs., grading, surfacing, Inv. 175-43-NEG 4, to J. R. Cianchette, 120 Main St., Pittsfield, Mass. Bids 7/16. CD 7/14.

★**†Maine** — IMPROVEMENTS — U. S. Eng., Park Square Bldg., Boston, Mass., imprvs., to Herbert Sargent, Bennock St., Stillwater, **$500,000-$1,000,000.** Est. $785,648. CD 7/9—ENR 7/16, under LB.

Maryland — IMPROVEMENTS — Industrial Company, imprvs., bldgs., to Cummins Constr. Corp., 803 Cathedral St., **$200,000.** CD 7/14—ENR 7/16.

†Maryland — RAILROAD SIDING — U. S. Eng., Standard Oil Bldg., Baltimore, railroad siding, to Western Maryland Railroad Co., Standard Oil Bldg., Baltimore. Est. under **$50,000.**

★**†Massachusetts** — WHARF — U. S. Eng., Park Square Bldg., Boston, wharf, Inv. 175-43-NEG 8, to C. J. Maney Co., Inc., 24 Dane St., Somerville. Est. **$2,000,000-$3,000,000.**

†Massachusetts — GASOLINE DISTRIBUTION SYSTEM—U. S. Eng., Park Square Bldg., Boston, gasoline distr. sys., fueling and storage, Inv. 175-43-NEB 19, to Aqua Systems, Inc., 250 Stuart St., Boston, less than **$50,000.** CD 7/23.

Massachusetts — IMPROVEMENTS — Industrial Company, imprvs., bldg., to Edmund J. Rappoli Co., Inc., 515 Massachusetts Ave., Cambridge. Est. over **$40,000.** Bids 7/15 CD 7/14—ENR 7/16.

★**†Massachusetts**—LANDING AREA—U. S. Eng., Park Square Bldg., Boston, landing area, Somerset Co., to Herbert Sargent, Bennoch Rd., Stillwater, Old Town, Me. **$500,000-$1,000,000.**

†Michigan—LIGHTING SYSTEM—U. S. Eng., 700 Union Guardian Bldg., Detroit, lighting sys., Jackson Co., to L. Schroth, Flint, under **$50,000.**

★**†Michigan** — ELECTRICAL DISTRIBUTION SYSTEM — U. S. Eng., 700 Union Guardian Bldg., Detroit, electrical distr. sys., to T. C. Rohn, Ann Arbor, less than **$1,000,000.**

UNCLASSIFIED (Contracts Awarded, Cont'd.)

†**Nebraska**—RAILROAD—U. S. Eng., 1709 Jackson St., Ohama, railroad constr., Cheyenne Co., to Peter Kiewit Sons Co. and George W. Condon Co., 1024 Omaha Natl. Bank Bldg., Omaha, **$100,000-$500,000.**

†**New Jersey**—ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng. Penn Mutual Bldg., Phila., Pa., electrical distr. sys., to E. Frei Sulzer & Co., Crawford. Est. under **$50,000.**

†**New Jersey**—RAILROAD—U. S. Eng., 201 Wall St., New York, N. Y., reconstructing 3.5 mi. mainline and 1 mi. sidings, rails, ties, ballasts, etc. and sewers, storm drains, manholes, inlets, **WPA. $55,733.** CD 6/29—ENR 7/2.

N. J. Bound Brook—PIPELINE—Bakelite Corp., River Rd., new pipeline, relaying pipelines underground, etc., to H. L. Harrison & Son, Inc., 1060 Broad St., Newark, **$35,000.** Francisco & Jacobus, 511 5 Ave., New York, N. Y., consult. engrs.

†**New Hampshire**—IMPROVEMENTS—U. S. Eng., Park Square Bldg., Boston, Mass., imprvs., grading, surfacing Inv. 173-43-NEG 10, to Central Constr. Co., Beacon Ave., Lawrence, Mass. Bids 7/20. CD 7/16.

†**New Hampshire**—WHARF—U. S. Eng., Park Square Bldg., Boston, Mass., wharf exten., Inv. 175-43-NEG 5, to M. & R. Constr. Co., 148 Border St., East Boston, Mass. Bids 7/17.

★†**New Mexico**—ELECTRIC DISTRIBUTION SYSTEM—U. S. Eng., Albuquerque, electrical distr. sys., to Bauman Electric & Neon Sign Co., El Paso, Tex., less than **$1,000,000.**

†**New Mexico**—ELECTRICAL SYSTEM—U. S. Eng., Albuquerque, primary electric sys. and wiring for several hundred bldgs., to Dozer Const. Co., Hutchinson, Kan.

†**New Mexico**—IMPROVEMENTS—U. S. Eng., Albuquerque, imprvs., to Arizona Const. Co., Deming. Bids 7/14. CD 7/9.

★†**New Mexico**—IMPROVEMENTS—U. S. Eng., Albuquerque, imprvs., military housing, to Mayfield, Levers & Lee Moore Contg. Co., 205 Bassett Tower Bldg., El Paso, Tex. Total est. entire project over **$5,000,000.**

†**New Mexico**—IMPROVEMENTS—U. S. Eng., Albuquerque, imprvs., concrete work and underground water storage tank, to F. Shufflbarger, Albuquerque.

†**New Mexico**—OIL STORAGE—U. S. Eng., Albuquerque, expanding oil storage, Barnalillo Co., to Bradbury & Marchant, Albuquerque, under **$50,000.**

New York—GAS SUPPLY MAINS—New York State Electric & Gas Corp., 123 S. Cayuga St., Ithaca, new double gas supply mains, each side of hy. between Waterloo and Seneca Falls, own forces. **$30,000.**

†**New York**—TRANSMISSION LINES—U. S. Eng., Chimes Bldg., Syracuse, installing transmission lines, to New York Power & Light Corp., 511 State St., Schenectady. Est. under **$50,000.**

†**North Carolina**—HEATING SYSTEM—U. S. Eng., 33 Customhouse, Charleston, heating sys., Mecklenburg Co., to Irvin C. Walker Plumbing & Heating Co., 122 S. College St., Charlotte, under **$50,000.**

†**Ohio**—PUMPS—U. S. Eng., Wright Field, Dayton, deep well turbine pumps, Greene Co., to Lieb Jackson, Inc., 337 S. High St., Columbus, under **$50,000.**

†**Ohio**—RAILROAD SIDNGS—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., railroad sidings, to Jones Contg. Co., Highland Park, Mich., less than **$50,000**

★†**Oklahoma**—IMPROVEMENTS—U. S. Eng., Denison, Tex., underground utilities, to Parrott-Oldt Co., 403 S. Haskell St., Dallas. Total est. over **$1,000,000.**

†**Oklahoma**—RAILROAD FACILITIES—U. S. Eng., 416 Wright Bldg., Tulsa, railroad facilities, Mayes Co., to Deckert & McDowell, 53 W. Jackson St., Chicago, Ill., under **$50,000.**

†**Oklahoma**—GRADING—U. S. Eng., Denison, Tex., grading imprvs., to Russ Mitchell, Inc., 2302 Jefferson St., Houston, Tex., **$50,000-$100,000.**

†**Oregon**—CLEARING, etc.—U. S. Eng., 628 Pittock Blk. S.W., 10 Ave. and Washington St., Portland, clearing, grading, Jackson Co., to Medford Cantonment, Medford, under **$50,000.**

★†**Oregon**—IMPROVEMENTS—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., imprvs., No. 698-104, to E. C. Hall Co. and J. C. Compton, Genl. Del., Corvallis, less than **$1,000,000.** Bids 7/16.

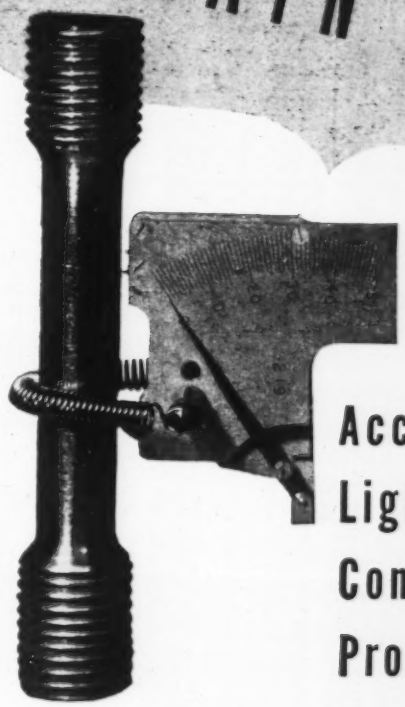
★†**Oregon**—TAXIWAYS, etc.—U. S. Eng., 628 Pittock Blk. S.W., 10 Ave. and Washington St., Portland, taxiways, hardstandings, fueling pit and hangar approaches, Benton Co., to E. C. Hall Co. & J. C. Compton, Corvallis, **$500,000-$1,000,000.** Bids 7/16.

Oregon—IMPROVEMENTS—Industrial Company, imprvs., to Borchert Constr. Co., 2201 S. E. Powell St., Portland, **$150,000.**

†**Pennsylvania**—STORAGE TANKS—U. S. Eng., Chimes Bldg., Syracuse, N. Y., storage tanks, to General American Transportation Co., Sharon. **$50,000-$100,000.**

PORTER-LIPP

STRAIN GAGE



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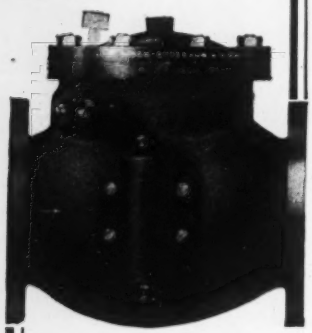

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

†**South Carolina**—HANGAR FRAMES—U. S. Eng., 33 Customhouse, Charleston, erecting steel frames for hangars, Richland Co., to Plowden & Roberts, 1428½ Taylor St., Columbia, under **$50,000.**

†**South Carolina**—IMPROVEMENTS—U. S. Eng., Walterboro, imprvs., paving extensions, to W. E. Cobb Constr. Co., Decatur, Ga. Bids 7/18.

South Carolina—MOTOR TRANSPORT FACILITIES—U. S. Eng., Fort Jackson, motor transport facilities, to C. G. Shockley, Columbia, Bids 7/22; cold storage facilities, utilities, to T. E. Moore & J. R. Holcombe, Columbia, Bids 7/21.

★†**South Carolina**—PARKING APRONS, etc.—U. S. Eng., 33 Customhouse, Charleston, paving parking aprons and runway exten., Colleton Co., to W. L. Cobb, Decatur, Ga., **$100,000-$500,000.**

★†**Tennessee**—IMPROVEMENTS—U. S. Eng., 306 U. S. Courthouse, Nashville, imprvs., sewers, water distr. sys., to W. L. Hailey & Co., Cotton States Bldg., Nashville. Est. less than **$3,000,000.**

★†**Tennessee**—IMPROVEMENTS—U. S. Eng., P. O. Box 97, Memphis, imprvs., No. 1092-42-234F, to Memphis Stone & Gravel Co., Exchange Bldg., Memphis. Est. less than **$1,000,000.** Bids 7/9. CD 7/6.

†**Texas** — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., Citizens Bank Bldg., Denison, electrical distr. sys., to Walco Eng. & Constr. Co., 2408 E. 4 Pl., Tulsa, Okla., less than **$50,000.**

†**Texas** — ELECTRIC LIGHTING and POWER SYSTEM — U. S. Eng., M and M Bldg., Houston, outdoor overhead electrical lighting and power sys., to Brooker Engineering Co., Bankers Mortgage Bldg., Houston. **$50,000-$100,000.**

†**Texas** — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., San Antonio, electrical distr. sys., to Taylor Constr. Co., Taylor. Est. under **$50,000.**

†**Texas** — ELECTRICAL DISTRIBUTING SYSTEM—U. S. Eng., Fort Sam Houston, outdoor overhead electrical distr. sys. for streets, roads and field hospital area units, Spec. 42-181, to Embry Electric Co., Brady, under **$50,000.** Awarded 7/17.

†**Texas**—GASOLINE FUELING SYSTEM—U. S. Eng., 25 St. and Avenue F, Galveston, gasoline fueling sys., McLennan Co., to Nash Gasoline Co., Austin. Est. **$50,000-$100,000.**

†**Texas**—GASOLINE FUELING SYSTEM—U. S. Eng., 25 St. and Avenue F, Galveston, gasoline fueling sys., Tom Green Co., to Nash Gasoline Co., Austin. Est. **$50,000-$100,000.**

†**Texas**—IMPROVEMENTS—U. S. Eng., Fort Same Houston, imprvs., Spec. 42-116, to R. W. Briggs & Co. and M. B. Killian, Sunset Rd., San Antonio. **$100,000-$500,000.** Bids 6/17.

★†**Texas** — IMPROVEMENTS — C. S. Eng., Federal Bldg., Galveston, bldgs., to McGough Bros., 610 Bankers Mortgage Bldg., Houston. **$100,000-$500,000**

†**Texas** — IMPROVEMENTS — U. S. Eng., Fort Sam Houston, imprvs., to Theo Montgomery & L. E. Whitham & Co., Wichita Falls, under **$50,000.** Bids July 9; construction, completion facilities for A. C. fueling sys. to Aqua System, Inc., 701 E. 3 St., Los Angeles, Calif., under **$50,000.** Both Spec. 42-175. Awarded 7/21.

★†**Texas** — IMPROVEMENTS — U. S. Eng., Federal Bldg., Galveston, imprvs., grading, building, asphalt paving new roads, streets, to H. B. Zachry, Laredo, **$100,000-$500,000.** CD 7/15—ENR 7/23.

†**Texas**—RAILWAY SPUR TRACK—U. S. Eng., 12 and Washington Sts., Waco, addnl. railway spur track, to Martin & Grace, 3954 Cass St., Dallas, and W. Smith, Waco, **$100,000-$500,000.**

†**Texas**—RAILROAD SPUR TRACK—U. S. Eng., 231 W. Main St., Denison, construction, operation, maintenance railroad spur track, Cooke Co., to Missouri-Kansas-Texas Railroad Co., Industrial Development Dpt., Katy Bldg., Dallas, under **$50,000.**

†**Texas**—RAILROAD—U. S. Eng., San Antonio, railroad, Tarrant Co., to Austin Bridge Co., 1813 Clarence St., Dallas, **$50,000-$100,000.**

†**Texas**—RELOCATING ELECTRIC POWER LINE—U. S. Eng., Denison, relocating electric power line, to Texas Power & Light Co., Interurban Bldg., Dallas. Est. under **$50,000.**

†**Texas**—ELECTRIC SYSTEM, etc.—U. S. Eng., San Antonio, electric, water and sewage sys., Bexar Co., to E. M. Null Pipe Line Contractor, Corpus Christi, under **$50,000.**

†**Texas** — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., 231 W. Main St., Denison, outdoor overhead electrical distr. sys., to Walco Eng. & Constr. Co., 2408 E. 4 Pl. Tulsa, Okla., **$50,000-$100,000.**

†**Texas**—IMPROVEMENTS—U. S. Eng., Fort Sam Houston, outdoor overhead electrical distr. sys., facilities, Spec. 42-169, to Williams & Whittle and Williams & Broughton, Mockingbird Lane, Dallas, **$50,000-$100,000;** roads, culverts, Spec. 42-139, to D. Word, 446 E. Rosewood St., San Antonio, **$50,000-$100,000;** boundary fence, Spec. 42-167, to K. E. Mason, Construction Bldg., Dallas, less than **$50,000.**

†**Texas**—IMPROVEMENTS—U. S. Eng., Antonio, hardstanding area, tion, Palo Pinto Co., to J. Sons, Austin, under **$50,000.**

★†**Texas** — IMPROVEMENT Federal Bldg., imprvs. lines, facilities, natural gas ties, sanitary sewer collecti drainage facilities, to H. B. to exceed **$5,000,000.**

†**Texas**—GASOLINE STORA —U. S. Eng., Federal Bldg. gasoline and fuel storage to Nash Gasoline Co., A **$50,000.** CD 7/21—ENR 7/23

★†**Tex., Childress** — TRAIN U. S. Eng., Citizens Bank work at air force training s Ball Constr. Co., Inc., 300 S Worth to exceed **$5,000,000.** 6/4.

Tex., Uvalde — HANGAR Hangar 6, Inc., Uvalde, 2 ste to flying field, to S. C. Pirtl St., Dallas, **$68,000.** Phelps & mons, Majestic Bldg., San Anto

†**Utah**—FENCING—U. S. Eng Pl., Salt Lake City, fencing, to B. P. Nelson, 425 W. Cap Lake City, under **$50,000.**

†**Washington** — IMPROVEME Eng., 800 3 Ave., Seattle, homish Co., to Chisholm & ham, under **$50,000.**

★†**Wisconsin** — ELECTRICAL TION, etc.—U. S. Eng., 408 electrical installation, to Harlan 3139 Hamilton St., Detroit, Mich. **$100,000***** plumbing, heating, to Hyland H & Co., 218 N. Bassett St., Madison, **$500,000***** grading, paving roads, to W. F Hunt, 2808 N. Sherman Blvd., Milwaukee, under **$50,000;** all foregoing work in Sauk

★†**Wisconsin** — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., 408 Federal Bldg., Milwaukee, overhead electrical distr. sys. and road lighting sys., to Kilborn Electric Co., Appleton. **$100,000-$500,000.** Bids 6/29. CD 6/26.

†**Wisconsin**—ELECTRICAL SYSTEM—U. S. Eng., 408 Federal Bldg., Milwaukee, electrical sys., to Havey Electric Co., Madison. Est. under **$50,000.**

★†**Wisconsin** — ELECTRICAL DISTRIBUTION LINES, etc.—U. S. Eng., 408 Federal Bldg., Milwaukee, overhead electrical lines, to Contracting & Material Evanston, Ill., est. **$100,000-$500,000;** installing piping for boiler house, to W. K. Mitchell & Inc., 2940 Ellsworth St., Phila., Pa., est. under **$50,000***** concrete pipe fittings, to E. M. B. Freeport, Ill., est. **$100,000-$500,000***** garage houses, gate houses, laundry and offices, to Hamm-Walsh Contg. Co., Baraboo, est. **$50,000-$100,000.**

★†**Wisconsin**—STEAM HEATING, etc.—U. S. Eng., 408 Federal Bldg., Milwaukee, steam heating, ventilating, refrigeration, gasoline storage and dispensing sys., to Pfingradt Co., 221 W. Kilbourn Ave., Milwaukee **$100,000-$500,000.**

Wyo., Casper—RUNWAYS, etc.—National Co., runway paving and taxi strips, to Taggart Const. Co., Cody. Est. **$260,000.**

Alta., Calgary—AIRPORT—Dpt. Transport, Ottawa, Ont., addnl. development airport, runway and taxi strips, to Dutton Bros. & Co. Ltd., Calgary, about **$307,000.**

Alta., Claresholm — AERODROME — Dpt. Transport, Ottawa, Ont., addnl. development aerodrome, grading, smoothing hard surfaced taxi strip, drainage, etc., to General Const. Co. Ltd., Granville Island, Vancouver, B. C., about **$90,000.**

Alta., MacLeod—AERODROME—Dpt. Transport, Ottawa, Ont., addnl. development aerodrome, grading, smoothing, hard surface taxi strip, drainage, to General Const. Co. Ltd., Granville Island, Vancouver, B. C., about **$70,000.**

Alta., Shepard—AERODROME—Dpt. Transport, Ottawa, Ont., addnl. development aerodrome R1 to Currie Barracks, grading, smoothing, rolling, drainage, hard-surface runway, to Doncaster Const. Co. Ltd., Edmonton, about **$61,000.** Bids 5/11. CD 5/7.

★**B. C., Port Hardy**—IMPROVEMENTS—Dpt. Natl. Defense for Air, Ottawa, Ont., temporary accommodation (bldgs.) to Marwood Const. Co., Ltd., 540 Howe St., Vancouver, about **$1,000,000.**

★**B. C., Vancouver** — AERODROME — Dpt. Munitions & Supply, Ottawa, Ont., addnl. development aerodrome, landing strips, taxi exten., runways, to Columbia Bitulithic Ltd., Granville Island, about **$1,033,000.** CD 7/3—ENR 7/11.

★**Man., Gimli**—AERODROME—Dpt. Transport, Ottawa, Ont., aerodrome development, clearing, stumping, grubbing, grading, smoothing, hard surface runway, etc., for S.F.T. School, to Bird Const. Co. Ltd., 706 Confederation Life Bldg., Winnipeg, about **$690,000.**

N. B., Maitland—AERODROME—Dominion Govt., Ottawa, Ont., aerodrome development, grading, drainage, etc., to Standard Paving Ltd., Capitol Bldg., Halifax, N. S. Est. **$200,000.** Dpt. Transport, Ottawa, Ont., engr.

N. B., Moncton—AIRPORT—Dpt. Transport, Ottawa, Ont., exten. runways, constructing taxi strip, to Rayner Const. Co. Ltd., 23 Commercial St., Toronto, Ont., about **$145,000.**

UNCLASSIFIED (Contracts Awarded, Cont'd.)

N. S. Greenwood—AERODROME—Dpt. Transport, Ottawa, Ont., developing aerodrome, clearing, stumping, grubbing, grading, etc., to Municipal Spraying & Contg. Co. Ltd., 1350 Barrington St., Halifax, about **$350,000.**

Ont., Brantford—AERODROME—Dpt. Transport, Ottawa, addnl. development Burford aerodrome, S.F.T. School, grading, smoothing, hard surface taxi strip, drainage, to Johnson Brothers Co. Ltd., Brantford, about **$65,000.**

Ont., Goderich—AERODROME—Dpt. Transport, Ottawa, addnl. development relief intermediate aerodrome, clearing, stumping, grading and smoothing, to Sandy Contg. & Machine Works, Ltd., Victoria St., about **$45,000.**

Ont., Ottawa—WALL—J. R. Booth, Ltd., Booth St., concrete wall 125 ft. long, 20 ft. high, repairing timber deck, to Foundation Co. of Canada, Ltd., 1538 Sherbrooke St. W., Montreal, Que., approx. **$25,000.**

Que., St. Hubert—AIRPORT—Secy. Dpt Transport, Ottawa, Ont., addnl. development S.F.T. school airport, grading, stripping, smoothing, rolling, constructing hard surface runway and repairs, to Raymond, McDonell & Co. Ltd., 2020 Union St., Montreal, about **$170,000.** Bids 6/3.

Sask., North Battleford—AERODROME—Dpt. Transport, Ottawa, Ont., addnl. aerodrome development, grading, smoothing, hard surface taxi strip, to W. C. Wells, Wilkie, about **$90,000.**

LATIN AMERICA

PROPOSED WORK

Mexico—American Rolling Mills, Monoclava, plans steel or iron ore production plant primarily of blast furnace units, and constructing, equipping steel heavy armor plate rolling mill, in **Monoclava** area; La Consolidada, Monoclova, plans expanding steel production plant to include heavy goods production, **Monoclava** area; Monterrey Steel Co., Monterrey, plans addnl. blast furnace unit at existing steel plant, **Monterrey.**

Mexico—Dpt. Pub. Works & Communica-Trabajo, Lopez, 24, Mexico City, plans model city, taking bids several, or a series rubber processing plants in **Matamoros** area. E. Fuller, c/o General Delivery, Brownsville, Tex., consult. engr. Engineering Dpt. P. Wks. & Communications, Mexico City, engr. CD 7/8—ENR 7/16.

Mexico—Mexican Government, Scrita. de Trabajo, Lopez, 24; Mexico City, plans model home colony accommodating 8,650 persons with houses of up to 4 stories each, **Mexico City,** $1,850,000; Mexican Govt., Scrita. de Asistencia Publica, Mexico City, plans 150 bed civil general hospital, **Monclova,** $125,000; plans 300 bed civil general hospital, **San Luis Potosi,** $415,000.

Mexico—Tlaxcala Govt., Palacio del Estado, Tlaxcala, Tlax., plans imprv., expanding various road works, incl. one connecting Tlaxcala with adjoining Puebla state. $450,000. Loan obtained from Federal Government.

PUBLIC BUILDINGS

PROPOSED WORK

†**Alabama**—Coosa Valley Housing Auth., Sylacauga, demountable frame housing, Ala. 1078, for NHA. $156,593. Chas. McCauley, Jackson Bldg., Birmingham, archt.

†**Arizona**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., plans by Lescher & Mahoney, Title & Trust Bldg., Phoenix, bldgs., Mohave Co.

★†**Arizona**—U. S. Eng., Albuquerque, N. M., bldg. expansion. $2,000,000.

★†**California**—Pub. Housing Auth., NHA, Humboldt Bank Bldg., 785 Market St., San Francisco, bids soon, demountable housing, Project Calif. 4099, and dwelling units, Project Cal. 4258.

†**Calif., Ord Village**—Ord School Dist., Ord Village, bids soon, 1 story, frame, stucco school, Cal. 4901. **FWA,** R. Stanton & T. B. Mulvin, Del Monte Hotel, Monterey, archts.

†**Colorado**—U. S. Eng., Albuquerque, N. M., 5 houses. Over $200,000.

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., housing, Conn. 6092. $350,000. CD 7/10—ENR 7/16.

†**Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, school and hospital facilities. Russell & Axon, Consulting Engrs., Inc., Daytona Beach, engr.

†**Georgia**—U. S. Eng., Postoffice Bldg., Savannah, plans by Merry & Parsons, Augusta, housing utilities, Liberty Co.

†**Georgia**—U. S. Eng., Postoffice Bldg., Savannah, plans by Robert & Co., Inc., engrs. and archts., Bona Allen Bldg., Atlanta, temporary frame bldgs., technical facilities, Houston Co.

†**Idaho**—U. S. Eng., Pittock Blk., Portland, Ore., plans by Glenn Stanton, Railroad Exch.

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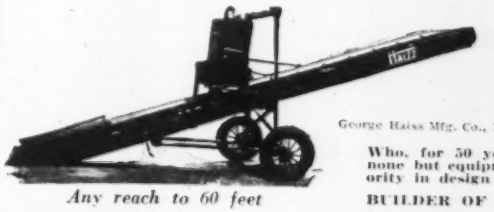

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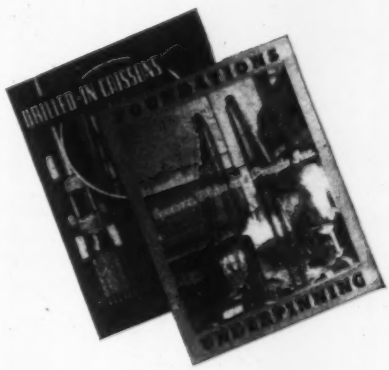

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

Bldg., and Hollis Johnston, Pittock Blk., both Portland Ore., engrs. and archts., bldgs., Twin Falls Co.

†Illinois—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, housing units in 3 areas.

†Illinois — City of Rock Island Housing Auth., 1320 Fourth St., Rock Island, bids soon, on revised plans by Cervin & Stuhr, Safety Bldg., Rock Island, brick, concrete, steel dwelling units, for NHA.

†Illinois—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, bids soon, housing project, grading, storm and sanitary sewers, water lines, electric lines, Ill. 11151. CD 7/2—ENR 7/9.

★ **†Illinois**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, bids soon, demountable dwelling units, grading, storm and sanitary sewers, electric lines, walks, Ill. 11083.

†Illinois—U. S. Eng., 520 Merchandise Mart, Chicago, plans by Burnham & Hammond, Inc., engr. and archt., 160 N. LaSalle St., Chicago, plant exten., Chicago Co.

†Ill., Moline—City bids soon hospital addn. $214,000. **FWA.** W. H. Schulzke, Moline, archt. CD 5/21—ENR 5/28.

★ **†Kansas**—Defense Plant Corp., 811 Vermont Ave. N.W., Wash., D. C., bids soon refinery, $5,500,000. National Refining Co., Coffeyville, will operate.

★ **†Louisiana**—U. S. Eng., Postoffice & Courthouse, Vicksburg, Miss., plans by Freeman, Christiansen, Huey and Cage, City Bank Bldg. and S. G. Wiener, Comm. Natl. Bank Bldg., Shreveport, military housing. CD 7/16—ENR 7/23.

★ **†Maine** — Pub. Housing Auth., NHA, 24 School St., Boston, Mass., dormitory apts., Me. 17038. Cram & Ferguson, 248 Boylston St., Boston, Mass., archts.

†Montana—U. S. Eng., Ft. Peck, plans by Keyes C. Gaynor, engr. and archt., 1624 Lacy Blvd., Sioux City, Ia., expansion facilities, Clark Co.

★ **†New Jersey**—Industrial Company, plans by William Neumann & Sons, 587 Summit Ave., Jersey City, altering and constructing plant. $1,500,000. Navy Dept. will finance.

★ **†New Mexico**—U. S. Eng., Albuquerque, housing. Over $2,000,000.

†New York—U. S. Eng., 31 St. James Ave., Boston, Mass., plans by Bley & Lyman, engrs. and archts., 505 Delaware St., Buffalo, N. Y., temporary frame bldgs., Niagara Co.

†New York—U. S. Eng., 120 Wall St., New York, N. Y., plans by York & Sawyer, 101 Park Ave., New York, dormitory and hospital addn., Orange Co.

†North Carolina—Industrial Company soon lets contract administration bldg., Spec. A-30. Federally financed. Sanderson & Porter, 52 William St., New York City, N. Y., engrs.

★ **O., Columbus**—Ohio State University, C. Steeb, secy., Brown Hall, 110 bed addn. to University Hospital, $550,000; research laboratory, $350,000; military science, shop and storage bldg. $110,000; airport, north of campus, $100,000. H. D. Smith, Brown Hall, university archt. and engr.

★ **†Rhode Island**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., announces error in reporting contracts housing, RI-3 and RI 1-1A, for Providence Housing Auth. Contracts not awarded. CD 6/15—ENR 6/18, under CA.

★ **†South Dakota**—U. S. Eng., Fort Peck, Mont., expansion bldgs. Over $2,000,000.

†Texas—U. S. Eng., Federal Bldg., Galveston, plans by Niven, Staub, Rather & Jenkins, 500 Stuart St., Houston, temporary frame structures, Robertson Co.

†Texas—U. S. Eng., Albuquerque, N. M., plans by W. C. Kruger, engr.-archt., Santa Fe, N. M., temporary housing, facilities, El Paso Co.

†Texas—U. S. Eng., Federal Bldg., Galveston, plans by Niven, Staub, Rather & Jenkins, 500 Stuart St., Houston, temporary frame structures, Limestone Co.

†Texas and **New Mexico**—U. S. Eng., Albuquerque, N. M., plans by Haynes & Strange, Parkhill, Voelcker & Dixon Associates, Lubbock, Tex., temporary frame bldgs., utilities, fueling sys., Ward Co., Tex., and Curry Co., N. M.

†Tex., Beaumont—City, will not construct, brick, stone, concrete, steel municipal hospital, Tex. 41-244, $265,000. **FWA.** Project abandoned. CD 7/1—ENR 7/9.

†Virginia—U. S. Eng., 415 Post Office & Courthouse Bldg., Norfolk, plans by Walter H. Wheeler & Associates, 330 E. 50 St., New York, N. Y. USO Army and Navy recreation bldg., Norfolk Co.

†Wisconsin—Pub. Housing Auth., NHA, 201 W. Wells St., Chicago, Ill., housing.

†Wisconsin—U. S. Eng., 408 Federal Bldg., Milwaukee, bldg.

★ **†Wyoming**—U. S. Eng., 1709 Jackson St., Omaha, Neb., housing. Over $2,000,000.

★ **Ont., Ottawa** — Secretary Dpt. P. Wks., temporary women's hostel, Sussex St. $700,000.

BIDS ASKED

Bids Asked August 5

†Md., Greenbelt—Farm Security Admin., Wash., D. C., new bldg. and addn. to old school bldg.

Ont., Ottawa—Dpt. P. Wks., valescent unit for Civic Hospital, $300,000. CD 6/29.

Bids Asked August

†Arkansas—U. S. Eng., Gay... Rock, bldgs., sewerage sys., wa... tric power lines and distr. sy... posit $10 each project, for ... west Ark.

Bids Asked August 1

†Ind., Marion—Veterans Adm... Bldg., Wash., D. C., clinical ... and connecting corridor, No. 1... No. 1867. Extended date. CD ...

Bids Asked August

†Fla., Jacksonville—St. Lu... Jacksonville 2 story hospital ... Fla. 814. $230,000. **FWA.** W. K... Rogers Bldg., archt.

Bids Asked August 1

†Wash., Bremerton—Pub. Bld... Proj. Engr. C. L. Berry, Jr., ... Court House, Seattle, Manette ... Docket Wash. 45-901-1.

Bids Asked September

†Pennsylvania—Pub. Housing ... 270 Bway., New York, N. Y., housing ... 36264. Extended date. Gleeson & ... 1612 Market St., Phila., archts. CD 7/14—ENR 7/16.

Bids Asked September 1

†Pennsylvania—Pub. Housing ... 270 Bway., New York, N. Y., housing ... 36265. Extended date. Zantzinger & ... Architect's Bldg., Phila., archts. CD 7/14—ENR 7/16.

Bids Asked

†Connecticut—Remington Arms ... Barnum Ave., Bridgeport (Bridgeport ... brick, steel plant expansion. $145,000. ... erally financed.

Mass., Hudson—Town, Electric Light & Power Dpt., Town Hall, (invited list bidders) brick addn. power plant. $40,000. A. L. Nelson, 31 St. James Ave., Boston, engr.

LOW BIDDERS

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, July 20, bldgs., facilities, Inc. 1096-43-23, from J. M. Brown Constr. Co., Shreveport.

†New Jersey—Long Branch Housing Auth., 138 Garfield St., Long Branch, July 20, houses, N.J. 8-2, for NHA, from Biltmore Constr. Corp., 945 Grand St., Brooklyn, N. Y., $237,000. CD 7/14—ENR 7/16.

†Texas—U. S. Eng., Fort Sam Houston bldgs., Spec. 42-150, from Templeton-Cannon & Broome, San Angelo, **$100,000-$500,000.** CD 6/30—ENR 7/2.

†Washington — Vancouver Housing Auth., Vancouver, two 1 story, frame bldgs., commercial center, for NHA, from Waale-Campbell Co., 2100 S.W. Jefferson St., Portland, Ore., and A. B. McCoy, Vancouver, **$168,484.**

CONTRACTS AWARDED

★ **†Alabama** — Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., dormitory apts., Ala. 1103 and Ala. 1104, to Algernon Blair, 1st Natl. Bank Bldg., Montgomery. H. ... Johnstone, 60 St. Francis St., Mobile, archt. CD 7/2—ENR 7/9.

†Arizona—Mesa Housing Auth., Mesa, brick houses, for NHA, to W. Peper Const. Co., Box 1564, Phoenix, **$186,500.** Bids 6/19. Lescher & Mahoney, Title & Trust Bldg., Phoenix, archts.

†Arizona—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., storage bldgs., to W. A. Beaubien, 2901 W. Taylor St., Phoenix. Est. under **$50,000.**

†Arizona—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., dismantle, haul, erect temporary bldg., Maricopa Co., to Daley Corp., S. 16 St., Phoenix, **$50,000-$100,000.**

★ **†California**—U. S. Eng., Wright Bldg., Sacramento, wooden storage bldg., Lassen Co., to Bressi & Bevanda Constructors, Inc., and A. Teichert & Son, Inc., 1846 37 St., Sacramento, **$100,000-$500,000.**

★ **†California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, frame storage bldg., Riverside Co., to Halper Constr. Co., 729 N. Highland Ave., Los Angeles, **$100,000-$500,000.**

★ **†California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, hospital addn., utilities, paving, Santa Barbara Co., to Andrew Nordin & Eric Flodine, 1347 Hauser Blvd., Los Angeles, **$500,000-$1,000,000.**

★ **†California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, temporary bldgs., Los Angeles Co., to O'Neal & Son and R. B. Hedberg, 8881 W. Pico Blvd., Los Angeles, **$100,000-$500,000.**

★ **†California**—Industrial Company, plant, to Ford J. Twaits Co., 451 S. Boylston Ave., Los Angeles. Est. **$5,500,000.** Federally financed. J. Gordon Turnbull, Citizens Bldg., Cleveland, O., engr. and archt.

★ **†California**—Industrial Company, design and construction plant, to Stone & Webster Co., 601 W. 5 St., Los Angeles. **$5,000,000.** Defense Plant Corp. will finance.

★ **†California**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, demountable housing, to W. C. Tait, 461 Market St., San Francisco, and Leibert & Trobock, Albert Bldg., San Rafael, and C. W. Caletti, 28 Francisco Blvd., San Rafael. R. M. Bates, Jr., Tribune Tower, Oakland, archt.

PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

★**†California**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, demountable housing, to H. Mayson, 9315 Hooper Ave., Los Angeles. R. M. Bates, Jr., Tribune Tower, Oakland, archt.

†California—U. S. Eng., 74 New Montgomery St., San Francisco, warehouses, to R. J. Minton Constr. Co., Crissey Field, San Francisco, and Howell Engineering Co., 333 Montgomery St., San Francisco. Est. **$50,000-$100,000.**

†California—U. S. Eng., 751 S. Figueroa St., Los Angeles, cold storage and warehouse Bldg., Riverside Co., to Fagstad & Bock, Los Angeles, under **$50,000.**

★**†Colorado**—U. S. Eng., c/o Postmaster, Denver, bldgs., to Brown-Schrepferman & Co., 19800 Penn. St., Denver. Est. **$500,000-$1,000,000.**

★**†Colorado**—U. S. Eng., c/o Postmaster, Denver, bldgs., to Al. Johnson Constr. Co., 608 Foshay Tower, Minneapolis, Minn., and Leck Co., 211 S. 11 St., Minneapolis, Minn. Est. **$1,000,000-$5,000,000.**

†Colorado—U. S. Eng., c/o Postmaster, Denver, housing, sewer, water, electric lines, to N. G. Petry, Denham Bldg., Denver.

★**†Colorado**—U. S. Eng., c/o Postmaster, Denver, military housing, to Al Johnson Constr. Co., 608 Foshay Tower, Minneapolis, Minn., and James Leck Co., 211 S. 11 St., Minneapolis, Minn. Est. over **$1,000,000.**

★**†D. C., Wash**—Pub. Bldgs. Admin., North Interior Bldg., dormitories, DC 49047, to Samuel Plato, P. O. Box 3971, Dundalk Station, Baltimore, Md.

★**†D. C., Wash.**—Pub. Bldgs. Admin., North Interior Bldg., dormitories, DC 49048, to Starrett Bros. & Eken, Inc., and John W. Harris Associates, Inc., Munsey Bldg.

★**†D. C., Wash.**—Pub. Bldgs. Admin., North Interior Bldg., housing, DC 49042, to Geo. A. Fuller Co., Munsey Bldg.

†Florida—U. S. Eng., Courthouse, Mobile, Ala., military housing facilities, Inv. 569-43-15, to Smith, Yetter & Griffin, 337 Worth Ave., Palm Beach.

★**†Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, temporary frame bldgs. for military housing, to W. A. Hart Co., 424 N.E. 6 Ave., Ft. Lauderdale, **$100,000-$500,000.**

★**†Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, temporary frame bldgs., Bradford Co., to Fred Howland, Inc., Postal Bldg., Miami, **$100,000-$500,000.**

★**†Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, bldgs., Inv. Neg-Jax-43-33, and bldgs., to Palmer Engineering & Const. Co., Cassatt Ave., Jacksonville***bldgs., Inv. Neg-Jax-42-134, to Puggn & Curtin, Sarasota***bldgs., Inv. Neg-Jax-43-16, and bldgs., water, sewage, electric service, Inv. Neg-H.S.-43-1, to J. S. Wilson, Worth Ave., Palm Beach***bldgs., Inv. Neg-Jax-42-154, to Stevens & Sipple, Orlando***storage bldgs., to Brady Roofing Tile Mfg. Co., 3266 N.W. 27 Ave., Miami, each contract less than **$1,000,000.**

★**†Florida**—U. S. Eng., Courthouse & Postoffice, Jacksonville, engineering, maintenance and inspection bldgs., Highlands Co., to Stephens & Sipple, Orlando. **$100,000-$500,000.**

†Georgia—U. S. Eng., Courthouse, Mobile, Ala., theatre of operations housing, facilities, Muscogee Co., to Williams Constr. Co., Fort Benning, Columbus, **$100,000-$500,000.**

†Georgia—U. S. Eng., 494 Spring St. N.W., Atlanta, bldgs., to Christian & Bell, 101 Marietta St. Bldg., Atlanta.

†Georgia—U. S. Eng., Postoffice Bldg., Savannah, theater, to A. R. Briggs, Macon.

★**†Georgia**—U. S. Eng. Courthouse & Postoffice, Jacksonville, Fla., housing facilities, Inv. Neg-Jax-42-163, to Alden Investment Co., Valdosta, less than **$1,000,000.** Awarded 7/15.

★**†Georgia**—U. S. Eng., 494 Spring St. N.W., Atlanta, housing, facilities, to Sanders, Marthame & Co., 774 Spring St., W., Atlanta. Est. less than **$500,000.**

★**†Idaho**—U. S. Eng., Pittock Blk., Portland, Ore., bldgs., to J. O. Jordan & Son, 406 S. 6 St., Boise, **$100,000-$500,000;** grading, drainage, parking areas, to Jacobsen-Jensen Co., 517 N.E. Stanton St., Portland, Ore. **$100,000-$500,000.**

★**†Illinois**—U. S. Eng., Courthouse & Custom house, St. Louis, frame bldgs., Sangamon Co., to The Kinmare Corp., 2816 W. Monroe St., Chicago, Ill. **$100,000-$500,000.**

★**†Illinois**—U. S. Eng., 612 Federal Bldg., Louisville, Ky., bldgs., to Kuhne-Simmons Constr. Co., Rantoul. **$100,000-$500,000.**

★**†Indiana**—Industrial Company, plant, to John Griffiths & Son, 228 N. La Salle St., Chicago, Ill. Est. about **$40,000,000.** Defense Plant Corp. will finance. Shaw, Naess & Murphy, 80 E. Jackson Blvd., Chicago, Ill., archts. CD 12/1/41—ENR 12/14/41.

★**†Indiana**—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., bldg., to Strom Constr. Co., P. O. Box 86, Grand Rapids, Mich., less than **$1,000,000.**

★**†Indiana**—U. S. Eng., 520 Merchandise Mart, Chicago, Ill., rebuilding plate mill, Lake Co., to F. H. McGraw & Co., Windsor St., Hartford, Conn. Est. **$100,000-$500,000.**

★**†Iowa**—U. S. Eng., Clock Tower Bldg., Rock Island, Ill., temporary frame bldg., Polk Co., to Building Service Co., Des Moines, **$500,000-$1,000,000.**

★**†Iowa**—U. S. Eng., Clock Tower Bldg., Rock Island, Ill., bldgs., to J. H. Hunzinger & Co., Security Bldg., Davenport, less than **$1,000,000.**

★**†Kansas**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., housing, to Consolidated Constr. Co., Wichita, **$5,475,258,** and Great Western Const. Co., 2558 Farnam St., Omaha, Neb., **$1,054,405.** Awarded 7/29. L. Schmidt, 1832 E. 2 St., Wichita, archt.

★**†Kansas**—U. S. Eng., 601 Davidson Bldg., Kansas City, Mo., addnl. bldgs., utilities, to H. H. Fox, Railway Exch. Bldg., Kansas City, Mo. Est. **$100,000-$500,000.**

★**†Kansas**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., heating for housing, to Electric Contractors, Inc., Wichita, **$411,830;** plumbing, to Ripstra Mechanical Constr. Co., 1015 E. Douglas St., Wichita, **$468,952.**

★**†Kentucky**—U. S. Eng., 612 Federal Bldg., Louisville, bldgs., to J. D. Jennings Co., 235 E. Caulbert St., Louisville.

†Kentucky—U. S. Eng., Postoffice & Courthouse, Cincinnati, O., bldgs., to F. M. Messer & Son, 2515 Burnet St., Cincinnati, O.

†Kentucky—U. S. Eng., Box 59, Louisville, bldgs., to Bass, Sternberg & Fleischer, Box 66, Morganfield. CD 7/21—ENR 7/23.

†Kentucky—Pub. Bldg. Admin., North Interior Bldg., Wash., D. C., rein.-con., brick school addn., plain fdn., to F. K. Vaughn Bldg. Co., Hamilton, O., **$194,000.**

★**†Louisiana**—Pub. Housing Auth., NHA, Electric Bldg., Ft. Worth, Tex., demountable dwellings, clearing, grubbing, to E. L. Brous, Commercial Bldg., Memphis, Tenn., approx. **$546,000.** Est. $400,000. CD 6/16—ENR 6/18.

★**†Louisiana**—U. S. Eng., Postoffice & Courthouse, Vicksburg, Miss., bldgs., utilities, to Werner Co., 1320 Pierre Ave., Shreveport. Est. **$100,000-$500,000.**

†Louisiana—U. S. Eng., foot of Prytania St., New Orleans, laundry addn., Vernon Co., to LeBlanc Bros., and W. R. Aldrich Co., Louisiana Natl. Bank Bldg., Baton Rouge, under **$50,000.**

★**†Maine**—U. S. Eng., Park Square Bldg., Boston, Mass., bldgs., utilities, Inv. 175-43-NEG-14, to Carilli Constr. Co., and John Basile, Inc., 281 Adams St., Dorchester, Mass. Est. under **$1,000,000.** Bids 7/20.

★**†Maryland**—Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., housing, MD 18084, to McCloskey & Co., 1620 W. Thompson St., Phila, Pa.

†Massachusetts—U. S. Eng., Park Square Bldg., Boston, military housing, Inv. 175-43-NEG. 17, to J. F. Fitzgerald Constr. Co., 214 Essex St., Boston.

†Massachusetts—U. S. Eng., Park Square Bldg., Boston, boiler units, accessories, Middlesex Co., to E. Keeler Co., Williamsport, Pa., under **$50,000.**

★**†Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, bldgs., to O. W. Burke Co., 1010 Fisher Bldg., Detroit, less than **$1,000,000.**

★**†Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, bldgs., to Paul M. Sterling Co., 114 Liberty St., New York, N. Y., less than **$1,000,000.**

★**†Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, bldgs., to Haberkorn-Barry Co., 2-135 General Motors Bldg., Detroit, **$100,000-$500,000.**

†Minn., Minneapolis—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 100 grain bins, 46 St. between Hiawatha and Minnehaha Aves., to Pearson Bros., 2202 Bryant Ave. S., and F. R. Lein, 5861 Portland Ave. **$40,000.**

★**†Mississippi**—U. S. Eng., Postoffice & Courthouse, Vicksburg, engineering shop, dental clinic, school, Lauderdale Co., to B. L. Knost, Pass Chrisian. **$100,000-$500,000.**

★**†Mississippi**—U. S. Eng., Aberdeen, bldgs., to Brice Bldg. Co., 215 S. 18 St., Birmingham, Ala. Est. less than **$3,000,000.**

★**†Missouri**—U. S. Eng., Courthouse & Custom house, St. Louis, military housing to Paddock Eng. Co. of Texas, 2929 N. Fitzhugh St., Dallas, Tex., **$100,000-$500,000.**

†Missouri—U. S. Eng., 601 Davidson Bldg., Kansas City, Mo., military housing, to Snyder-Johnson Co., Humboldt, Ia.***gas mains, to Midwestern Engineering & Constr. Co., Drew Bldg., Tulsa, Okla.***addnl. streets, walks, to L. W. Hayes Co., Bethany.

★**†Montana**—U. S. Eng., Administration Bldg., Fort Peck, Mont., frame bldgs., facilities, to R. D. Merrill Const. Co., Helena, **$500,000-$1,000,000.**

†New Jersey—U. S. Eng., Penn Mutual Bldg., Phila., Pa., brick storage bldg. addn., to William Moncrieff, 101 Neversink Ave., Rumson, under **$50,000.**

†New Mexico—U. S. Eng., Albuquerque, bldg. to Parks-Marshall-McCloskey Constr. Co., Construction Bldg., Dallas, Tex. **$50,000-$100,000.** CD 7/9—ENR 7/16.

†New Mexico—U. S. Eng., Albuquerque, inspection and adjustment bldg., Otero Co., to H. T. Ponsford & Sons, 914 E. Missouri St., El Paso, Tex., **$50,000-$100,000.**

★**†New York**—U. S. Eng., 120 Wall St., New York, temporary housing, to Roberts Nash Constr. Corp., 39-15 Main St., Flushing. Est. **$100,000-$500,000.**

★**†New York**—Pub. Housing Auth., NHA, 270 Bway., New York, demountable housing, Proj. N.Y. 30101, to Duplex Constr. Co., Glens Falls. **$570,000.** Bids 6/16. CD 6/18—ENR 6/25, under LB.

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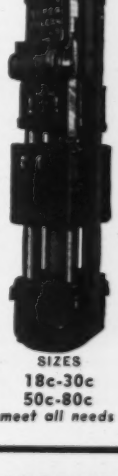

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

★**†New York**—U. S. Eng., Chimes Bldg., Syracuse, expanding bldgs., to O'Driscoll & Grove, Inc., and Chapman-Kruge Engineering Co., 247 Park Ave., New York. To exceed **$5,000,000.** CD 7/20—ENR 7/23.

★**†North Carolina**—National Carbon Co. Inc., 30 E. 42 St., New York, N. Y., plant, to Gillmore, Carmichael, Olsen, Co., 1873 E. 55 St., Cleveland, O. Total est. **$6,000,000.** Defense Plant Corp. will finance.

★**†Ohio**—U. S. Eng., Penn Mutual Bldg., Phila., Pa., temporary frame storage bldgs., Trumbull Co., to D. T. Riffle, 1006 Forbes St., Pittsburgh, Pa., **$100,000-$500,000.**

★**†Ohio**—Industrial Company, plant bldgs., to S. N. Nielsen, 3059 Augusta Blvd., Chicago, Ill. Federally financed. Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich., engr.

★**†Ohio**—Industrial Company, mfg. plant, to A. M. Higley Co., 2036 E. 22 St., Cleveland. Total est. **$20,000,000.** Defense Plant Corp. will finance. CD 7/10—ENR 7/16.

★**†Ohio**—U. S. Eng., Federal Bldg., Detroit, Mich., bldgs., to Steinle-Wolfe, Inc., 1515 Croghan St., Fremont. Est. less than **$1,000,000.** Bids 6/29.

†Ohio—U. S. Eng., 925 New Federal Bldg., Pittsburgh, Pa., furnishing, installing heating units in warehouses, to Geo. B. Stewart Co., 5960 Baum Blvd., Pittsburgh, Pa. Est. **$50,000-$100,000.**

★**†Ohio**—U. S. Eng., 649 Federal Bldg., Detroit, Mich., bldg. addn., to Darin & Armstrong, Inc., 2041 Fenkell Ave., Detroit, Mich., est. less than **$1,000,000** *** building, electric distr. sys. and sanitary sewerage sys., to Ohio State Const. Co., 22 E. Say St., Columbus, est. less than **$1,000,000;** leveling, backfilling, fills, concrete fdns., concrete work, to Green-Sawyer Co., Domestic Bldg., Lima, est. over **$100,000***** roads, parking areas, drainage sys., to Hinton & Smalley, 304 W. Market St., Celina, est. less than **$1,000,000.** Industrial Company will operate.

†Ohio—U. S. Eng., U. S. Post Office & Courthouse, Cincinnati, garage, to Advance Constr. Co., 2129 Freeman St., Cincinnati. Est. under **$50,000.**

†Ohio—U. S. Eng., Wright Field, Dayton, emergency power plant, Montgomery Co., to R. G. Danis Co., 1518 E. 1 St., Dayton, under **$50,000.**

★**†Oklahoma**—U. S. Eng., 231 W. Main St., Denison, Tex., temporary housing, Tillman Co., to H. L. Rogers and The Webb Co., 1940 Oakland St., Fort Worth, Tex., **$500,000-$1,000,000.**

★**†Oklahoma**—U. S. Eng., Citizens Bank Bldg., Denison, Tex., bldgs., to Watson Co., 1927 S. Akard St., Dallas, Tex., **$500,000-$1,000,000.**

†Oklahoma—U. S. Eng., 416 Wright Bldg., Tulsa, bldgs., to J. Putney, 221 N.W. 22 St., Oklahoma City.

★**†Oklahoma**—U. S. Eng., 231 W. Main St., Denison, Tex., general housing, Tillman Co., to Rausner-Wolfe & Jackson, Dallas, Tex. **$100,000-$500,000.**

★**†Oregon** — Government Agency housing units, to George Buckler Co., Lewis Bldg., Portland. Est. **$18,000,000.** Wolff & Phillips, Pearson Fourth Ave. Bldg., Portland, archts.

★**†Pennsylvania**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts., N.W., Wash., D. C., housing, to Henry E. Baton, Inc., 1717 Sansom St., Phila. Est. over **$600,000.** W. R. Morton Keast, Commonwealth Bldg., Phila., archt.

†Pennsylvania—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., housing, to F. Butterworth, 27 E. Durham St., Phila. Est. over **$300,000.**

★**†Pennsylvania**—U. S. Eng., 6 and Walnut Sts., Phila., bldg., to Lauter Constr. Co., Otis Bldg., Phila. Est. **$100,000-$500,000.**

★**†South Carolina**—U. S. Eng., 33 Customhouse, Charleston, central heating sys. for hospital, to W. B. Guimarin & Co., 1412 Taylor St., Columbia. Est. **$100,000-$500,000.**

★**†South Carolina**—U. S. Eng., 33 Custom House, Charleston, housing, utilities, to Charleston Constructors, Inc., Tradd St. and Adgers Wharf, Charleston. Est. **$100,000-$500,000.**

†South Carolina—U. S. Eng., 33 Customhouse, Charleston, blacksmith shop, stable, appurtenances, Charleston Co., to R. B. Simmons, Charleston, under **$50,000.**

★**†South Dakota**—U. S. Eng., Admin. Bldg., Fort Peck, Mont., plant wiring, electrical work, to Granite City Elec. Co., 13 5 Ave S., St. Cloud, Minn.; crushed stone, to Joslin & McAllister, N. 303 Haven, Spokane, Wash. Total est. entire project over **$5,000,000.**

★**†Tennessee** — Industrial Company, plant, to L. O. Stocker, Arcade Bldg., St. Louis, Mo., about **$1,000,000.** Federally financed. Bids 5/11. CD 5/1—ENR 5/7.

†Texas—U. S. Eng., Fort Sam Houston, storehouse, grading, surfacing sidewalks, etc., Spec. 42-178, to G. Sippel, New Braunfels, **$50,000-$100,000.** Bids about 6/8.

★**†Texas**—U. S. Eng., Fort Sam Houston, bldgs., to Lee Christy, Builders Exch. Bldg., San Antonio, **$100,000-$500,000.** Awarded 7/21.

★**Texas**—U. S. Eng., Fort Sam Houston, military bldgs., to Investment Service Corp., 313 Great Natl. Life Bldg., Dallas, **$100,000-$500,000.** Awarded 7/21

†Texas—U. S. Eng., Fort Sam Houston, shop bldgs., to Central Contg. Co., Construction Bldg., Dallas, **$50,000-$100,000.** Awarded 7/19.

★**†Texas**—U. S. Eng., Federal Bldg., Galveston, miscellaneous frame bldgs., to McClellan-Brown-McClellan, Amicable Bldg., Waco, **$100,000-$500,000**

†Texas—U. S. Eng., Fort Sam Houston, bldgs., Spec. 42-162, to Geo. P. O'Rouke Const. Co., 2019½ Jackson St., Dallas, **$100,000-$500,000.** CD 7/2—ENR 7/9.

†Texas—U. S. Eng., Fort Sam Houston, bldgs., Spec. 42-165, to Geo. P. O'Rourke Constr. Co., 2019½ Jackson St., Dallas, approx. **$100,000-$500,000.** Awarded 7/20. CD 7/2—ENR 7/9.

†Texas—U. S. Eng., Fort Sam Houston, warehouse, to J. E. Morgan & Sons, El Paso. **$50,000-$100,000.** Awarded 7/21.

†Utah—U. S. Eng., 32 Exchange Pl., Salt Lake City, altering warehouses, Weber Co., to Young Constr. Co., 1st Natl. Bank Bldg., Salt Lake City, under **$50,000.**

★**†Virginia**—Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., dormitories, Va. 44013, to O. T. Graham & Co., Inc., Mutual Bldg., Richmond; utilities, to John McShain Inc., 17 and Spring Garden Sts., Phila., Pa.

★**†Virginia**—U. S. Eng., 415 Postoffice & Courthouse Bldg., Norfolk, steel, concrete bldgs., Elizabeth City County, to Virginia Engineering Co., Inc., Newport News, Va., **$100,000-$500,000.**

★**†Virginia**—U. S. Eng., 415 Post Office & Court House Bldg., Norfolk, recreational areas, to Perkins-Barnes Const. Co. Inc., Blackstone, **$100,000-$500,000.**

★**†Washington**—U. S. Eng., 800 3 Ave., Seattle, military installation, King Co., to Foster & Kleiser Co., 1675 Eddy St., San Francisco, Calif., **$500,000-$1,000,000.**

★**†Washington**—U. S. Eng., Textile Bldg., Seattle, bldgs. to General Constr. Co., 3840 Iowa St., Seattle, **$100,000-$500,000;** housing, utilities, to A. W. Johnson Co. Inc., 208 E. Pacific St., Seattle, and Goetz & Brennan, Seaboard Bldg., both Seattle, **$100,000-$500,000.**

†Washington — U. S. Eng., 800 3 Ave., Seattle, shop, to Hazen & Clark, Welch Bldg., Spokane. Est. under **$50,000.**

†Wisconsin—A. O. Smith Corp., 3533 N. 37 St., Milwaukee, plant, A. E. M., to Siesel Const. Co., 514 E. Ogden Ave., Milwaukee, over **$300,000.** Defense Plant Corp. will finance. CD 11/19—ENR 11/27.

★**†Wisconsin**—U. S. Eng., 408 Federal Bldg., Milwaukee, bldgs., to Wolfes-Jensen & Co. Inc., 127 N. Dearborn St., Chicago, Ill.*** grading, paving, to W. F. Hunt, 2808 N. Sherman Blvd., Milwaukee***bldgs. to Hamm-Walsh Contg. Co., Baraboo***lateral and sanitary sewers, etc., DA-W-1095-163, to E. M. Rocho, Freeport, Ill.

★**†Wyoming**—U. S. Eng., Administration Bldg., Fort Peck, Mont., bldgs., to Metcalf-Hamilton Constr. Co. and Kansas City Bridge Co., BMA Bldg., Kansas City, Mo. Est. over **$2,000,000.** CD 6/1—ENR 6/4.

★**Alta., Lethbridge** — Dpt. Natl. Defense, Ottawa, Ont., temporary bldgs., to Smith Bros. & Wilson Ltd., 104 Dominion Bank Bldg., Regina, Sask., about **$820,000.**

★**B. C., Port Alberni**—Dpt. National Defense, Ottawa, Ont., army training center accommodation for brigade camp, to Carter-Halls-Aldinger Co. Ltd., 670 Taylor St., Vancouver, about **$1,000,000.**

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Los Angeles—Western Defense Housing Corp., c/o Douglas & Baird, archts., 1041 E. Green St., Pasadena, frame, stucco dwellings, Laurel Canyon Blvd. and Strathern St. $270,000.

Kan., Olathe—C. Vawter, 4220 W. 59 St., 50 residences. $200,000.

N. J., Metuchen—O. Bass, 535 Main St., plans by R. W. Sailor, 628 Wyoming Ave., Elizabeth, 10 two story, bsmnt., 24x100 ft., brick veneer garden apartments. $400,000.

★**N. J., North Arlington (br. Arlington)**—Wood Cliff Holding Co., 95 Hudson St., Hoboken, plans by L. G. Feinen, 32 Walnut St., Newark, eight 2 story, bsmnt., frame, brick veneer apartment bldgs. $625,000.

N. J., Raritan—Roosevelt Park Estates, 2 and Lafayette Aves., plans by R. P. Wilson, 46 Paterson St., New Brunswick, 50-two story, bsmnt., frame and shingle homes, Raritan Twp. $225,000.

O., Euclid (br. Cleveland)—Finbar Homes, Inc., A. Bauer, 18105 Hiller Ave., 40 houses. $200,000.

Pa., Sharon—J. J. Bensmiller, Mt. Royal Blvd., Glenshaw, fifty 1½ and 2 story, bsmnt., brick veneer residences. $300,000.

Tenn., Memphis—P. Belz, 1764 Morehead St., plans by P. Kapelow, Sterick Bldg., six 4-apartment and 35 two-apartment bldgs., brick veneer. $250,000.

Tex., Houston—Housing Inc., F. Sharp, pres., Esperson Bldg., frame type dwellings, Market St. Rd. 2 mi. outside city limits. $200,000.

Que., Montreal — A. Gravel, archt., 513 Rachel St. E., soon lets contract, 42 dwellings, Vian St., for Union Economique d'Habitations, Rosemont Blvd. $200,000.

CONTRACTS AWARDED

Calif., Burbank—Boulevard Improvement Co., 1703 W. Victory Blvd., 21 apartment bldgs., to David Rice, 11935 Tennessee Ave., Los Angeles, approx. **$150,000.** Est. $152,150.

★**Calif., Napa**—D. D. Bohan[illegible] ket St., and Ross H. Cha[illegible] El Camino Real, San Carlos, Western Homes, Inc., 559 [illegible] own forces. **$4,000 to $4,700**

Calif., Richmond—Defense [illegible] ment Co., 312 Kearny St., San [illegible] one story homes, Pullman [illegible] Aves., to J. H. Rodda, P. O. [illegible] Alto, about **$228,000.**

Calif., Richmond—Walker-Bu[illegible] Spruce St., Berkeley, sixty-fou[illegible] dences. Owner builds. **$3,000**

Calif., Stockton—L. Rubino, [illegible] St., 57 one story, frame house[illegible] Jefferson, S. Harrison, W. Clay [illegible] and S. Lincoln Sts., Owner bui[illegible]

Conn., East Hartford (br. Hartford)—[illegible] Hartford Gardens, 70 Maple S[illegible] housing units, Maple, Lafayette [illegible]cle. Owner builds. **$195,000.** [illegible] Deerfield Ave., Hartford, archt.

★**Conn., East Hartford (br. [illegible]Hartford)**—Milbrook Park Co., Inc., 18[illegible] frame homes, Naubuc Ave., [illegible] Forbes Sts. Owner builds. Est. $2,100,000. CD 7/17—ENR 7/23.

Conn., New Britain—Warner Bros. Theatres, Inc., 321 W. 44 St., New York, N. Y., rebuilding brick, steel theatre, Main St., to B. Stein Building Co., 1000 Main St., Hartford. Est. **$150,000.** CD 7/7—ENR 7/9.

La., New Orleans—Oak Lawn, Inc., J. R. Jones, pres., 1101 Metairie Rd., 109 homes in 1100 block Metairie Rd., to G. P. Favrot, Balter Bldg., **$362,500.** Awarded 7/18. R. De Buys, 1514 Calhoun St., archt.

Me., Portland—Deering Village Corp., G. E. Fineberg, 618 Congress St., defense homes, Allen Ave., separate contracts. **$165,000.**

Md., Baltimore—Metropolitan Developing Co., 208 E. Lexington St., thirty-five 2 story, 26x50 ft. concrete, cinder block apartment bldgs. Owner builds. **$385,000.** H. A. Miller, 421 St. Paul St., archt.

N. J., Hillside (br. Elizabeth)—Cornell Constr. Co., 3 Central Ave., Hartsdale, N. Y., fifty 1½ story, 25x30 ft. frame and siding residences, separate contracts. $200,000. G. G. Foster, Wood St., Lynbrook, N. Y., archt.

★**O., Columbus**—Myrtle Ave. South, Inc., E.E. Smotkin, pres., Myrtle Ave. S., 31 dwellings, Myrtle, Delbert, Bretton and Taylor Aves., and north of Hudson St., to American Homes Assn., 2451 Joyce Ave., **$1,200,000.** C. Inascho, 16 E. Broad St., archt.

O., Columbus—Capital Investment Co., 22 W. Gay St., housing, Colonial Hills Addn., to Arthur Olson Inc., 5705 N. High St. Est. over **$150,000.** T. Tibbals, 15 and High Sts, archt. - Jennings-Laurence, 12 N. 3 St., engrs.

★**Pa., Hatboro**—Sam Minskoff & Sons, 521 5 Ave., New York, N. Y., 150 one family homes, 31 acre tract. Owner builds. **$750,000.**

Tex., Houston—Housing Inc., F. Sharp, pres., Esperson Bldg., frame type dwellings, Market St. Rd., 2 mi. outside city limits, day labor. **$190,000.**

Wis., West Milwaukee—Dwyer McMicken Co., 1412 S. 72 St., 20 duplex flats with bsmnts., 26x30 ft., frame, concrete block fdns. Owner builds.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Sacramento—SHEDS—Western Pacific R.R Co., T. L. Phillips, ch. engr., 526 Mission St., San Francisco, soon lets contract, freight sheds addns, 4 and R Sts.

★**Illinois** — PLANT — Schmidt, Garden & Erikson, archts., 104 S. Michigan Ave., Chicago, soon lets contract, 1 story, brick, concrete plant, for Industrial Company. Over $1,000,000. H. J. Maveety, 53 W. Jackson Blvd., Chicago, structural engr. CD 7/13—ENR 7/16.

★**Ind., Mishawaka**—POWER PLANT—Indiana & Michigan Electric Co., 220 Colfax Ave., South Bend, plans by American Gas & Elec. Service Corp., archt. and engr., 30 Church St., New York, N. Y., power plant addn., 105x133 ft. turbine room and boiler house, 66x76 ft. office and storage bldgs., brick, structural steel frames, rein.-con. fdns., near here. $550,000.

Mass., Quincy—WAREHOUSE—Bethlehem Steel Co. E. Howard St., soon lets contract, brick Warehouse 10, Fore River, $40,000.

Mich., Tecumseh — FACTORY — Tecumseh Mfg. Co., Tecumseh, plans by Hahn & Hayes, 723 Adams St., Toledo, O., 1 story, 150 x 250 ft., steel, brick, concrete factory, plain fdn. $50,000.

N. J., Kearny (br. Arlington)—WAREHOUSE—Theobald Industries, Sanford Ave., rebuilding storage warehouse. $100,000.

N. J., Summit—PLANT—Zahodiakin Engineering Corp., 250 W. 54 St., New York, N. Y., 2 story, bsmnt., brick mfg. plant, Morris Turnpike.

N. J., Trenton—MANUFACTURING—Turbo Engineering Co., 43 Nottingham Way, bids soon 1 story, 77x800 ft., mfg. bldg. W. Slack & Sons, 1401 State St., archts.

★**O., Canton** — SUBSTATION — Ohio Power Co., 305 Cleveland Ave. S.W., substation, Georgetown Rd. $500,000.

O., Cleveland—FACTORY—Pump Engineering Service Corp., B. Lyman, 12910 Taft Ave., altering factory, $75,000. McGeorge & Hargett, 9400 Quincy Ave.

INDUSTRIAL BLDGS. (Proposed Work, Cont'd.)

★**Tex., San Antonio** — REFINERY — M. C. Friel & Associates, Oakland, Calif., c/o Manufacturers Assn. of San Antonio, Smith-Young Tower Bldg., sugar beet refinery. $1,-700,000.

Wis., Milwaukee—GARAGE—TMER & T. Co., 231 W. Michigan Ave., 1 story, 45x342 ft., brick, steel garage, rein.-con. fdn.

BIDS ASKED

Connecticut—PLANT—Vought-Sikorsky Div. United Aircraft Corp., 550 Main St., Stratford, (selected list bidders) altering, renabilitating plant. Over $40,000. CD 7/13—ENR 7/16.

Mass., Salem—FACTORY—Atwood & Morrill, 48 Loring Ave. (selected list bidders), 1 story, brick factory addn. $40,000. Andrew Jones Biscoe & Whitmore, 50 Congress St., Boston, archts.

Pa., Conapolis — FACTORY — Continental Roll & Steel Foundry Co., 144 and R R Sts., East Chicago, Ind., H. F. Felgenschuh, dir. purchases, general contract, 3 story 40x120 ft. locker room and 2 story, 30x60 ft., shop bldg. and tool room. G. Bickerstaff, 1411 Investment Bldg., Pittsburgh, archt. E. S. Tower, 213 Investment Bldg., Pittsburgh, engr.

CONTRACTS AWARDED

California—ADMINISTRATION BUILDING —Industrial Company, administration bldg., to MacIsaac & Menke, 3440 E. 22 St., Los Angeles, approx. **$260,000.**

California—FACTORY—Industrial Company, factory, to Buttress & McClellan, 1913 E. 8 St., Los Angeles, approx. **$250,000.** H. Eckert, 1913 E. 8 St., Los Angeles, archt.

Calif., Asti—PLANT—Italian Swiss Colony, Asti, 3 bldgs., for manufacture cream of tartar, own forces. Over **$40,000.**

Calif., Bakersfield—FOUNDRY—Haberfelde Laughlin Steel Co., Haberfelde Bldg., steel foundry, to C. R. Nicholson, 1733 Buena Vista St., approx. **$150,000.** CD 7/22.

Calif., Manteca—PLANT—H. Moffat Co., 8 and Howard Sts., San Francisco, design and construction cattle feeding plant, to H. E. Bahlmann, 251 Kearny St., San Francisco, about **$115,000.**

Calif., Redwood City — PLANT — Pacific Bridge Co., 333 Kearny St., San Francisco, cribbings plant, wharf imprv., railroad spur track, own forces. **$100,000.**

Calif., Sausalito—SHOP—W. A. Bechtel Co., 155 Sansome St., San Francisco, shop bldg., to Alfred P. Fisher, 300 Montgomery St., San Francisco. Est. over **$40,000.**

Ill., Chicago — FACTORY — Chicago Gear Mfg. Co., 2823 W. Fulton St., 2 story 27x146 ft., brick factory addn., to Continental Constr. Co., 340 N. Central Ave.***plumbing, heating, to Northern Plumbing & Heating Co., 4617 N. Western Ave.***electrical work, to Ernest Freeman Co., 416 W. Erie St. Est. **$60,000.** W. Fred Dolke, 189 W. Madison St., archt.

Ia., Cedar Rapids—FACTORY—Link-Belt Speeder Corp., 2 story, 85x120 ft., brick, steel, asbestos siding factory, to Loomis Bros., 509 3 Ave. S.E. Est. **$75,000.** M. S. Carstens, 1 N. LaSalle St., Chicago, Ill., archt.

Md., Baltimore—FACTORY—John C. Knipp & Sons, 600 S. Pulaski & Sons, 1 story, part bsmnt., brick, factory and office, concrete fdns., to Cogswell Constr. Co., 513 Park Ave. Est. **$60,000.** J. R. Edmunds, Jr., 409 Calvert Bldg., archt.

Md., Relay—PLANT—Jos. E. Seagram & Sons, 7 St. Rd., Louisville, Ky., 1 story, 100x 170 ft. regauge bldg., to Frantz Constr. Co., 18 W. Chase St., Baltimore, **$70,000.** Est. $75,000.

Mass., Medford (br. Boston)—TRANSPORTATION UNIT—GARAGE—C & H Co., 60 New Cross St., Somerville, 1 story, 100x125 ft., brick, concrete transportation unit-garage, to Bratt Constr. Co., 28 Colbine Rd., Brighton. Est. **$40,000.** CD 4/2—ENR 4/9.

Mass., Quincy — PLANT — Bethlehem Steel Co., E. Howard St., brick addn. Q Bldg., hack saw plant, to F. Leroy Fox, Inc., 101 Milk St., Boston. Est. **$40,000.** CD 7/14—ENR 7/16.

Michigan — FACTORY — Industrial Company, remodeling factory, 1520 Division Ave., to Owen, Ames, Kimball Co., 38 Pearl St., Grand Rapids. **$65,000.** B. W. Hertel, Grand Rapids, archt.

Mo., St. Louis—SERVICE—Arthur R. Lindburgh, Inc., 3556 Lindell Blvd., 1 story, 70x100 ft., brick, concrete service bldg., addn., concrete fdn. to A. H. Stiel, Inc., 813 Chestnut St. Est. **$40,000** with equip. H. K. Graf, 2825 Olive St., archt.

New Jersey — MANUFACTURING — Industrial Company, mfg. bldg. alterations, to O. A. Peterson Constr. Co., 75 N. Willow St., Montclair.

New Jersey — FACTORY — Industrial Company, factory, to M. Riesz, 871 King George Rd. Fords, **$40,000.**

N. J., Boonton—PLANT—Ferris Instrument Corp., Boonton Ave., conversion and general repairs 2 story, bsmnt. mfg. plant, separate contracts. Over **$40,000.**

N. J., Harrison—LABORATORY—Worthington Pump & Machine Corp., Harrison Ave., 1, 2 and 3 story, 80x230 ft., brick, steel, testing laboratory, Harrison Ave., to Wigton Abbott Corp., 1225 South Ave., Plainfield. Est. over **$40,000.**

N. J., Newark—PLANT—Breeze Corp. of America, 35 S. 6 St., 3 story, bsmnt., 40x50 ft., brick mfg. bldg. addn., 35 S. 6 St., to W. L. Blanchard Co., 45 Pioneer St., **$40,000.** S. A. Spawn, 500 Central Ave., archt.

N. J., Trenton—PLANT—Turbo Engineering Co., 43 Nottingham Way, 4 story, bsmnt., 77x170 ft. mfg. plant, to J. W. Ferguson, 152 Market St., Paterson, **$60,000.** W. Slack & Son, 1401 State St., archt.

N. Y., New York — FACTORY — Hydrawmatic Machine Co., 40s Concord Ave., 2 story, 72x126 ft. factory and office bldg., separate contracts. **$75,000.** CD 7/1—ENR 7/9.

★**O., Cincinnati** — FACTORY — Cincinnati Shaper Co., factory and office bldg., Paddock Rd., north of B. & O. R.R., to Ferro Concrete Const. Co., 203 W. 3 St. Est. **$500,000.**

O., Dover—FACTORY—Sparklet Devices, Inc., 272 Badger Ave., Newark, N. J., remodeling factory, to Wendling Bros. Co., 933 Wooster Ave. Est. **$50,000.**

O., Toledo — FACTORY — Acklin Stamping Co., 1925 Nebraska Ave., 1 story, 54x380 ft. factory addn., to George W. Lathrop & Sons, Inc., 1510 Montcalm St. Est. **$65,000.**

O., Toledo—FACTORY—Toledo Scale Co., Telegraph Rd., factory addn., to George W. Lathrop & Sons, Inc., 1510 Montcalm St. Est. **$200,000.**

Oregon — FURNACE — Industrial Company, metal furnace bldg., to D. J. Malarkey, McKay Bldg., Portland. **$50,000.** Awarded 7/17. C. E. Seage, General Delivery, Portland, archt.

★**Pennsylvania**—PLANT—Pennzoil Oil Co., A. W. Klinger, purch. agt., Drake Theatre Bldg., Oil City, mfg. plant, to A. G. McKee, 2300 Chester Ave. N.E., Cleveland, O. Est. **$1,000,000-$3,000,000.**

Pa., Erie—PLANT—Erie Forge Co., G. W. Stout, genl. mgr. and vice pres., 15 and Cascade Sts., 1 story, brick, steel heat treating plants, east and west of plant, separate contracts. Est. **$50,000.**

Pa., Pittsburgh—PLANT—American Radiator & Standard Sanitary Corp., G. M. Maier, asst. to vice pres. in charge, Bessemer Bldg., facilities, substructures, to B. A. Groah Constr. Co., 847 W. North Ave., N.S. Est. **$50,000.**

Pa., Williamsport — PLANT — Williamsport Wire Rope Div. Bethlehem Steel Corp., Williamsport, 1 story, 60x230 ft., plant addn., to Lundy Const. Co., 1896 W. 4 St. Est. **$40,000** with equip. Awarded about 7/17.

R. I., Cranston (br. Providence)—PLANT—Fire Safe Builders Products Corp., Mill St., 1 story, 107x288 ft., frame, concrete plant, separate contracts. CD 7/13—ENR 7/16.

R. I., Woonsocket — FACTORY — French Worsted Co., 153 Hamlet St., brick factory, to Pelletier Constr. Co., 173 Bailey St. Est. **$40,000.** CD 7/16 under Woonsocket—ENR 7/23 under Bristol.

Utah, Lehi—PLANT—Emsco Corp., South Gate, Los Angeles, Calif., silica brick plant, to W. E. Ryberg Co., 207 Interurban Bldg., Salt Lake City. **$219,800.** Bids 7/13. CD 6/30.

Wis., La Crosse—PLANT—Swift & Co., Stock Yard, Chicago, Ill., dehydrated milk plant and large boiler plant, to F. R. Schwalbe & Son, La Crosse. Est. over **$40,000.** CD 6/7—ENR 6/9.

Wis., Milwaukee—FOUNDRY—Pelton Steel Casting Co., 148 W. Dewey Pl., 2 story, 80x112 ft. pattern storage vault and 1 story, 43x100 ft. flask and pattern layout bldg., etc., to Edward Steigerwald & Sons, Inc., 5310 W. State St. Building Engineering Services, 1101 N. VanBuren St., engrs.

Wis., Milwaukee—GARAGE—TMER & T Co., 231 W. Michigan Ave., 1 story, 45x341 ft., brick garage, rein.-con. fdn., W. Fond du Lac Ave., to Walter W. Oeflein, Inc., 5345 N. Hopkins Ave. F. Luber, Jr., c/o owner, archt. CD 7/17—ENR 7/30.

Wis., Sheboygan — STORAGE — Verifine Dairy Products Co., 936 N. Water St., 1 story, 30x102 ft., concrete, brick storage bldg., concrete fdn., to J. Houmes, 813 St. Clair Ave. E. A. Stubenrauch, 708 Erie Ave., archt.

Ont., Leaside (Toronto)—PLANT—Canada Wire & Cable Co., Ltd., Laird Dr., Leaside, plant addn., to R. J. Hibbs Const. Co., 15 Trent Ave., Toronto, **$60,000.** CD 7/1—ENR 7/16.

Ont., Peterboro—PLANT—T. Pringle & Son, Ltd., engrs., 36 Toronto St., Toronto, 1 story plant addn., McDonnel St., for Dominion Woolens & Worsteds, Ltd., 80 Richmond St., W. Toronto, to Chestnut-McGregor Ltd., 96 Bloor St. W., Toronto. **$40,000.** CD 7/8—ENR 7/16.

Que., Montreal—PLANT—Canadian Car & Fdry. Co. Ltd., 621 Craig St. W., 84x300 ft., wood and part brick addn., Turcot Propellor Div. plant, to Foundation Co. of Canada, Ltd., 1538 Sherbrooke St. W., about **$181,700.**

★**Que., Montreal**—PLANT—R. C. A. Victor Co., Ltd., 976 Lacasse St., plant addn., to J. L. E. Price & Co., Ltd., 680 Sherbrooke St. W., Montreal, about **$611,000** equipped. W. K. G. Lyman, 2058 Victoria St., archt.

Que., Rock Island—PLANT—Union Twist Drill Co., Ltd., Rock Island, 3 story, 86x186 ft., rein.-con. plant addn., to J. J. Shea & Co. Ltd., 660 St. Catherine St. W., Montreal, **$275,000.** CD 7/1—ENR 7/9.

Sask., Taylorton—PLANT—Dominion Electric Power Ltd., Estevan, power plant addn., day labor. **$40,000.** CD 7/8—ENR 7/16.

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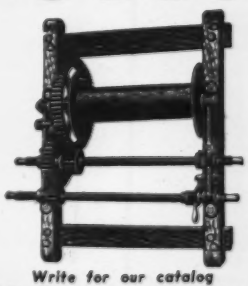

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(Continued on Opposite Page)

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